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CONTENTS

In the general news columns there is published at some length an abstract of the majority opinion of the United States Supreme Court in the Missouri river rate case. A careful reading of the opinion will show that the court confined itself very strictly to the narrow question of whether the Interstate Commerce Commission had or had not the power to make the order reducing that portion of the through rate from Atlantic seaboard cities to Missouri river cities charged by the railways between the Mississippi and the Missouri. The majority opinion emphasizes strongly the attitude of the court as treating the orders of the Interstate Commerce Commission as presumably reasonable; but, on the other hand, apparently neither in this case nor in the cases cited in this opinion, does the court hold that it will not inquire into the reasonableness of the commission's orders if sufficient evidence is presented to show that the order worked an injustice to the railways concerned. An abstract of the Denver case is not published because it simply follows the reasoning and conclusions in the Missouri river rate case. In the short dissenting opinion, written by Justice White and concurred in by Justice Holmes and Justice Lurton, stress is laid on the fact that the dissenting justices do not think it necessary to go at length into the reasons for their dissent, because "the reasoning by which the court now gives to the order of the commission the narrow basis thus stated as the solution of that question, depends upon the idiosyncrasies of this particular case, and involves no principle of general importance."

If a distant signal is too far back from the home signal, so far that enginemen may run a good distance after passing it before reducing speed, it ceases to be of practical value and its use is an absurdity; this is the view of Mr. Arkenburgh, as expressed in another column. As there are a good many signals thus placed and as we seldom, if ever, hear of any bad results from their use, this strong language is somewhat surprising; but as Mr. Arkenburgh is in close touch with operating officers in the middle west we must assume that the view which he expresses is not entirely without support. We must assume that western runners do not properly heed the distant indications. In the effete east, however, the requirement that a runner shall learn the length and character of every block is not considered burdensome. And those officers who are most thoroughly old-fashioned in their habits of mind feel ashamed if they have to confess to the presence on their division of any runners who do not know the road perfectly. Moreover, where some of the trains run at 70 miles an hour and it is therefore necessary to put the distant three or four thousand feet back, it is inevitable that slow trains shall get the distant indication too early; but with good discipline the thing can be managed. But Mr. Arkenburgh's remedy is quite illogical. He cannot trust his runners to hold an indication in mind for a minute or two, yet he proposes to trust them to "pick up" home signals without any landmark whatever. As, in time of fog or blinding snow, this would necessitate serious and frequent reductions in speed, he would have to do a good deal more trusting than he bargained for. Unless his trains were all slow and easy to manage he would have to trust the runners to lose time and then trust them to have the courage to face the superintendent who, very likely, expects them to accomplish both safety and speed, however poor the facilities. Not the least of the difficulties of the general manager is that of finding superintendents who can be trusted not to take this unreasonable attitude towards enginemen.

The present railway commission of Connecticut consists of three members with a salary of $3,000 each. It has been for years an infirm body in its personnel, a "political" commission in its recognized character and a target of just criticism by those familiar with railway affairs in the state. One of its members, who lately died, was a party "boss," and one of the present members is now handling the canvass of United States Senator Buckley, who is a candidate for re-election. Reform of the commission is, however, at its dawn. Following last year's strenuous and unsuccessful fight for a new public service commission—a matter sure to figure actively in the coming state campaign—the State Business Men's Association has published a new bill significant in its pointings toward betterment. It raises salaries from $3,000 to $7,500, equalizing them with those of the higher state judges; increases the number of commissioners from three to five; allows them to hold shares in the public service corporations of which they have purview; and, should it pass the legislature in proper shape, will forbid all political activity on the part of the commissioners. The proviso al-

lowing stockholdings is, in particular, a cheering reaction from the policy of some states which seem to go on the theory that a man must divest himself of interests and become a pauper to qualify for a public service commission. In that category has belonged Connecticut, which refuses to let her railway commissioners hold either steam railway or street railway shares. The new bill, which is almost sure to be the leading measure before the next state legislature, prefigures what must sooner or later be the trend of state railway commissions in the country at large. Their expanded powers, higher responsibilities, and the call not only for integrity but for trained knowledge, some, at least, of it technical, must inevitably raise ere long the average personnel. In such a commission it is the man rather than the law that counts, and the ounce of training, courage, experience, judgment and personal quality is worth in practice the ton of statute.

One of the stock arguments for stringent regulation of railway rates is that the government, by making large grants of land to some roads, made it possible for them to be built and thereby acquired the right to limit their earnings to a "fair return." If some of those who use this argument would investigate just what the roads got out of their land grants they would be both enlightened and surprised. For example, the land donated to the Union Pacific in what is now the state of Wyoming included a 400-ft. strip through the state for 445 miles, or approximately 22,196 acres. In 1862 this was worth, at the government's price, $1.25 per acre, or $27,745, an amount less than what it would now cost to reproduce a half mile of the Union Pacific. Besides this, the government gave the Union Pacific 5,000,000 acres in Wyoming. While, as already stated, the government's price was $1.25 per acre, the Union Pacific sold over 70 per cent. of this grant for from 44 cents to $1.25 per acre. It underbid the government in selling land to settlers because it was anxious to develop the country along its lines and thereby increase its traffic. Then it was a benefactor. When now it charges high enough rates for hauling freight for the people whom it thus settled along its lines to earn a return approximating the ordinary rate of commercial profit, it is a malefactor!

The Florida East Coast Railway is best known to the many fashionable (and other) people who pass over it on their way to and from the winter resorts on the east coast of Florida during the season. At that time they find fine, luxurious passenger trains, which are often crowded, and are not much bothered by meeting or passing freight trains. This tourist traffic fairly begins in December, gets into full swing in January (the finest hotels not opening till then), and comes almost to a full stop by the end of April. There is but a very narrow strip of cultivable land—at least of cultivated land—between the sea and the piny woods in the north and the everglades in the south, some of which is very valuable, because it permits the growth of some semi-tropical fruits and has a climate for winter market-gardens, with a direct outlet to market. The monthly reports of earnings made to the Interstate Commerce Commission show some of the effects of this peculiar state of things. In the year to June 30, 1909, this line earned gross on its 584 miles $3,373,554, or $5,576 per mile; and net, $1,835 per mile, against $937 net per mile the previous year, when it averaged 535 miles of road. Of these earnings nearly 34 per cent. was from passengers. There seems nothing very remarkable in that. But in the five months ending with November, 1909, the passenger earnings were $207,785, while in the following three months they were $544,303—an average of $41,557 in the first five months, and of $181,434 in the winter months—which suggests some problems in the use of equipment, trainmen, etc. The freight traffic is also heavier in winter, but the contrast is not so great. It yielded an average of $92,707 per month, June to November, and $138,501 for the three winter months. This fluctuation of traffic with the seasons affects the profits to a much greater degree. For the first five months of the fiscal year the Florida East Coast Railway was a charitable institution in 1908, the working expenses and taxes having been $136,132 greater than the gross earnings. And in 1909 the net for these five months was but $54,870, an average of $10,974 per month; while in the three months of last winter they rose to $353,288, or $117,763 per month. The railway at its best, however, is not a mine of gold. It is known that it, or its owner, owns a chain of large and popular hotels on the line, which are usually well filled and sometimes crowded from early in January until near the middle of April; and he, or the company, owns a considerable amount of land on the line. Whether these enterprises altogether yield a satisfactory interest on the investment cannot be told by reports of the railway's earnings; but people will draw their own inference as they see it pushed vigorously through the sea to Key West.

THE ARRESTED ADVANCES IN FREIGHT RATES.

By the agreement reached by President Taft and representatives of the railways at conferences at the White House on Monday and Tuesday the railways both gain and lose. The western roads will be allowed to collect the advances which they already have put into effect. The roads in general will be relieved of their fears of sweeping prosecutions of all roads under the anti-trust law. On the other hand, the conferences seem to have settled it that no more important advances in rates will be made in the United States without the previous express approval of the Interstate Commerce Commission. After the bill now pending in Congress is passed, the roads will have no legal right to make advances against which anyone complains, until the commission has considered the complaint; and the action of the administration in attacking the western roads in the courts under the Sherman act has practically put this provision of the bill into effect before its enactment. To all intents and purposes the day when the railways of this country can freely initiate their interstate charges is past. We have government regulation of rates in full flower. The real rate making power is no longer the traffic managers, but the Interstate Commerce Commission. The traffic managers may still make reductions, but as they no longer have power to raise rates which they have reduced, it is possible that the number of volutary reductions they will make in the future will be very small compared with what it has been in the past.

The course of the government stops advances in rates until after the pending railway bill shall have been passed and gone into effect and the commission, acting under it, shall have had time to investigate the reasonableness of the proposed advances. It will be at least a week or two before the new law goes into effect. It will take the commission probably a long time after that to make its investigation of the proposed advances, even though it does not adjourn soon for its summer vacation. Consequently, even if the commission shall finally hold some or all of the proposed advances reasonable, it will be a long time before the railways will be able to begin to collect them. Meantime federal boards of arbitration continue to render decisions in favor of advances in wages, which not only go into effect at once, but which are retroactive. Only last week the board which arbitrated the differences between the western railways and their firemen made an award of advances in wages of 10 to 12 per cent. which was made effective from May 16; and the roads already are paying increased wages to many other classes of employees.

Wages, like death and taxes, are certain; income, for the next few months at least, is uncertain. The railways will be in the same situation as that of which merchants and manufacturers complain when a congressional discussion of the tariff on imports unsettles all their calculations for months

at a time. The commission at best must be slow; and we shall be lucky if important rate questions do not get into the courts, which are likely to be slower. The President has the fairest intentions, no doubt; and the commission has not been intentionally unfair to the railways. But the roads do feel that unintentionally it has been unfair. Perhaps they are mistaken about this. Perhaps its seeming unfairness has been due to the fact that heretofore it has had power when it found an unfair discrimination to correct it only by reducing the higher rate. It may be that when the general question of advances in rates is presented to it, it will show that it is just as willing to correct discriminations by raising rates that are too low, as by reducing those that are too high. If so, it may be practicable to make a general readjustment which will put charges as a whole on a fairer basis. However that may be, it is evident that the main thing to be aimed at and hoped for now is the early presentation to the commission, and, if necessary, to the courts, of the general question of whether the roads are entitled to changes in their tariffs which will increase their earning capacity. The sooner that question is settled the better it will be for every industrial, commercial and financial interest. Nobody denies that the railways have to bear their full share of the burden of the "increased cost of living," nor that as a whole their rates have remained nearly or quite stationary for years. By all rational analogies the burden of proof should be on the government (or the shippers) to show that the volume of railway business has increased in the very large percentage that would be necessary to offset the great increases in expenses that are being everywhere reported.

COMPOUNDING AND SUPERHEATING IN LOCOMOTIVES.

The successful application of compounding or superheating to locomotives depends to a large extent on the consistent observance of a few fundamental principles, which, though plainly laid down in the text books and taught in the technical schools, have not always been properly recognized in connection with locomotive operation. Thus, the relation of the economy of compounding to speed in locomotives has not been understood or there would not have been so many compound express locomotives built with the expectation of saving a large percentage of fuel. Neither would the failure of these engines to show a good economy have discouraged the application of the compound principle to the slower moving freight locomotives.

With the gradually increasing use of superheating on locomotives there is a liability of similar confusion and disappointment. It is an interesting fact that with superheating the relation of speed to economy is reversed; that is, more saving will be obtained from the application of superheating to passenger engines than to the slower freight locomotives. An appreciation of these facts seems to have dictated the policy of the Lancashire & Yorkshire Railway in its efforts to save fuel by compounding and the use of superheaters.

The methods used and the reasons for them are explained in a very interesting paper read at a meeting of the Institution of Mechanical Engineers, March 17, 1910, by George Hughes, chief mechanical engineer of that railway. On this line compounding has been applied only to freight engines, and superheating has effected less economy on them than on passenger engines. In the paper referred to the author points out that the value of compounding largely depends upon reduction of the range of temperatures in the cylinders and that high piston speed of itself reduces this range in express service even with early cutoff, but these conditions do not exist in slow running freight engines. A piston speed of 600 ft. per minute appears to be the critical point. Below this speed condensation in the cylinder is sufficient to justify a reduction of the range of temperature by compounding. Above 600 ft. per minute the period is too short for the interchange of much heat between the steam and the cylinder walls, and little improvement can be effected by compounding passenger engines.

With a 30-in. stroke of piston and 62-in. wheels at 25 miles per hour the piston speed is 632 ft. per minute, and this is a high average speed for freight service. Passenger locomotives with 30-in. stroke and 84-in. wheels make 1,116 revolutions at 60 miles per hour, and at 45 miles per hour, which may be taken as a fair average running speed, the piston speed is 837 ft. per minute; with smaller drivers the speed would be still higher. The rule thus applies well to American practice and in a simple manner explains the failure of our compound passenger locomotives to show a fuel economy superior to equivalent simple engines. The four-cylinder balanced compounds, which have been built in large numbers in this country, may have been justified on account of their balanced feature, as the extra pressure on the rails at high speed is comparatively small in amount. These engines also have an advantage over those with two cylinders in their large cylinder volume and larger hauling capacity at high speed, but so far as we are informed a superior fuel economy has never been demonstrated by their measured performance.

Four-cylinder balanced compounds have also been built with large drivers for fast freight service, but it is a remarkable fact that this arrangement of cylinders has not been applied to consolidation engines where the slow piston speed would enable them to operate with maximum economy. The enormous freight traffic of this country is largely hauled by simple consolidation locomotives. Mallet compounds have, in many instances, shown a fuel economy of 25 or 30 per cent., and in some cases 40 per cent., in coal per 100 ton-miles, as compered with the simple consolidation locomotive previously used, but this saving would not be nearly so large if the comparison were made with compound consolidation locomotives. Many railways do not have heavy mountain grades which would justify the use of Mallet compound engines, but there is no good reason why they should not obtain a substantial improvement in fuel economy by the use of four-cylinder balanced compound consolidation locomotives.

The fuel economy secured by highly superheated steam in passenger service has been fully demonstrated and on account of the lower cost of application it might be considered a more attractive method of saving coal in freight service than by compounding. But under ordinary conditions an equal amount of saving by superheating is not to be expected in that service. The reason for this is given in Mr. Hughes' paper. We have not before noticed this important point referred to in discussions of superheating in locomotives. The test of compound freight engines, compared with those with the superheater, showed that a proper interpretation of the time element is necessary, because this element can place the coal consumption on either side of the balance sheet. The superheater freight engine showed an advantage in fuel economy over the compound after deductions were made for detentions, shifting and other time losses incident to freight service, but when these detentions were included the compound was more economical than the superheater. These results indicate that the frequent stoppage of trains is prejudical to superheating. When there is a stop of about four minutes the temperature of the superheater elements drops to about that of saturated steam, and they must be reheated after each stop. The absorption of heat in this process reduces the economy. The same thing occurs on an undulating line where the engine is running down grade with a closed throttle much of the time.

The improvements in locomotives intended for the saving of fuel, which are now receiving the most attention, are the compound feature in the Mallet articulated locomotive for freight service and the use of the superheater for passenger engines, but the consolidation type of engines, which is doing the large bulk of the work on railways, is built as a simple

engine, being the same in principle as it was when it first appeared on the Lehigh Valley in 1866. Consolidation engines are consuming about twice as much coal per annum as engines in passenger service, and the saving of fuel that might be effected by compounding the very large number of engines of this type now in service offers one of the largest opportunities for economy at present afforded to the mechanical departments of railways.

NEW BOOKS.

Metal Spinning. By C. Tuells and W. A. Painter. The Industrial Press, New York. 38 pages; 9 in. x 6 in.; paper. Price, 25 cts.

This treatise, No. 57, is one unit in a comprehensive series of reference books, each covering one subject. The whole series comprises a working library of mechanical literature in which the mechanical engineer, the master mechanic, the designer, the machinist and tool maker will find the special information he wishes to secure, selected, carefully revised and condensed. This treatise gives a description of spinning in general and outlines some of the methods and tools used in spinning for rapid production.

Surveyor's Handbook. By T. U. Taylor, Chicago. The Myron C. Clark Publishing Co. 310 pages; 4½ in. x 6½ in.; 116 illustrations; flexible cover. Price, $2.00.

To a man who can read understandingly, this little book contains a great deal of information. It is one of those productions that would be of value to an engineer who has been out of practice for a time and has become rusty in the matter of details, and to whom a suggestion is quite sufficient to bring everything back again. The book, however, does more than suggest; it takes up the details of surveying and the handling and use of instruments in a manner that even a novice could follow. For example, in the chapter on chain surveying, there are the usual descriptions of the various types of chains and tapes, with formulae for temperature, sag and stretch corrections. This is followed by chapters on compass and transit surveying, in which methods and operations are well covered with brief descriptions. Leveling and computation of earthwork, city surveying and methods of correction are treated in the same concise way. In fact, there is very little in the work of the surveyor that is not touched upon, and, indeed, pretty well covered in this little book. At the end there are the usual tables of logarithms of numbers and sines, cosines, tangents and cotangents, and a table of earthwork computations.

Letters to the Editor.

THE INTERNATIONAL RAILWAY FUEL ASSOCIATION.

Chicago, June 6, 1910.

To the Editor of the Railway Age Gazette:

I note on page 1331 of your issue of June 3 editorial comment on the second annual meeting of the International Railway Fuel Association. I beg to endorse the statements contained in your editorial, and in doing so I feel that deserved criticism of the work of this most important association will always make for improvement. I have never heard disputed the statement that fuel is, while one of the most important, at the same time one of the most neglected features of railway operation. Everybody admits the fact, but, withal, we do not rise to the occasion. Progress is no doubt being made, but the work is moving slowly.

We were unfortunate in holding our convention at a time when the coal mines of six states, and serving an immense area of territory, were suffering an unwarranted suspension of activity; this fact was not only responsible for keeping a great many of our members away from the meeting, but also prevented the more active members from giving the work of the association the attention its importance warranted during the period immediately preceding the meeting. What the International Railway Fuel Association needs is the active co-operation and encouragement of the general managers of the railways whom its membership serves, and it is the intention of the Executive Committee to make a direct appeal to these gentlemen to give the association such assistance and encouragement as will insure a meeting next year of a character that will not in any measure be disappointing.

The association, to the best of its ability, tried to get before the railway and coal consuming public the immense economic loss that the railways are suffering at the present time, due to the mine suspension referred to above, and if this organization can ultimately secure by some means an elimination of unwarranted mine suspensions no apology for its existence need be made.

Eugene M'Auliffe,
Member, Executive Committee.

THE MALLET LOCOMOTIVE.

Boston, Mass., April 25, 1910.

To the Editor of the Railway Age Gazette:

Your recent articles* on the internal and track resistances of Mallet locomotives and your later comments* on the adaptability of this type for high speeds are of great interest. The large frictional resistance must have been anticipated by all thoughtful persons.

It is a matter of surprise to me that the Mallet locomotive "takes" as much as it does and no doubt a part of it is due to capable salesmanship. That their use is wise in most cases where adopted I do not doubt, for their economy in fuel, repairs and attendance per ton-mile must be lower than with other types. This comes, of course, from their enormous size and the compound feature. It can no longer be said that American railway men are afraid of complication, for the Mallet locomotive is the maximum of complication thus far placed on wheels. "Complication" was familiar to my ears 18 or 20 years ago when I was trying to introduce a compound locomotive. It is, of course, justifiable when much is to be gained by it, and it would seem, now, that this is fully understood. Everything possible must be done to reduce the cost of hauling freight, and hence the justification of the Mallet locomotive.

The Mallet locomotive, however, is far from being a machine that is satisfying to the imagination, for who can contemplate an extraordinarily long boiler with an engine under one end rigidly connected to it, and another under the other end not rigidly connected to it, and "hitched" to the former by a link and pin. The front engine moves violently sidewise with irregularities and curvature of track and it must often appear as if the boiler was going over the fence. It is prevented from doing so only by the comparatively short wheel base under the trailing end. Such an arrangement must require courage on the part of both designer and operator and is surely "unmechanical."

There is another way, however, to design a double-truck locomotive, such that the friction will be less than with the Mallet; it will take curves and irregularities with "sweetness," and it may be operated at the greatest possible speed with safety. I refer to the Fairlie locomotive. This engine should now be appreciated in this country. Such engines when built with two steam trucks have thus far had boilers with the firebox midway between the ends, two sets of tubes, two smokeboxes and two smokestacks. This arrangement for oil burning might be used now, but for coal burning it could not be tolerated, and of course if the engines were compounded it would hardly be practicable unless each

*"The Mallet Locomotive in Service," March 11, page, 513. "The Speed Limits of Mallet Locomotives." April 1, page 870; April 29, page 1077; May 20, page 1249. "Performance of Mallet Engines on the Great Northern," April 15, pages 979 and 997. "The Mallet Compound Locomotive and Its Limitations," April 22, page 1025.

truck was a compound. The center firebox has some advantages. It can be of any width and length, on grades the water level does not change, and if there are any objections to long tubes it overcomes them. There is no reason, however, why a boiler with the firebox at one end and a smokebox at the other cannot be mounted on two center bearing swing trucks and all connections be satisfactorily made for pulling a train. What, then, is the objection to such a locomotive? I can see nothing except a few more flexible steam pipes, one set of which would contain high-pressure steam. William Mason successfully solved this part of the problem when he introduced the Fairlie locomotive into this country, and some of them (single ended) can be seen on the Boston, Revere Beach & Lynn, where no other type has ever been used. Mason built only one double-end locomotive, named "Janus," which was finally sold to the Lehigh Valley.

Such a locomotive would track and ride as easily as a Pullman car, and for the same reasons. Likewise it would take curves at high speed. The center bearings would be large in diameter, and, in view of the great success of Timkin roller bearings in automobiles, could rest securely on conical rollers operating in grease in a tight casing, which would still further reduce the internal and track resistances.

Referring to your article in the April 22 issue, wherein you seek to show the lack of need of Mallet locomotives for high speed; when one sees the frequency with which the Twentieth Century Limited and other fast trains are provided with two locomotives, the reason for an extra heavy and powerful locomotive is almost apparent. The same causes of economy would result from their use as is the case in freight service.

In regard to the common types of locomotive for extra heavy and fast passenger service, the consolidation type is still available and may be provided with larger boilers and cylinders than ever, and can probably be, in some satisfactory way, compounded. The late Geo. S. Strong used to say that the consolidation type of locomotive would sometime surely be used for passenger service.

F. W. DEAN.

LIMITED SPEED OF PASSENGER LOCOMOTIVES.

Philadelphia, Pa., May 28, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The letter of C. B. Chaney, Jr., which appears on page 1294 of your issue of May 27, is of particular interest to me, as I too have for some time been of the opinion that the eight-wheel engine was abandoned too soon. I think, however, that the design submitted by Mr. Chaney would hardly be practicable for high-speed service, although I have no doubt that at speeds of 60 miles per hour and less, which are now quite common, the design would prove to be very efficient.

As several of our railways are successfully maintaining regular schedules which require speeds of 60 miles per hour, let us pass to the consideration of a train speed of 80 miles per hour, which we may consider exceptional at present. At the speed of 80 miles per hour, the 7-ft. driving wheels of Mr. Chaney's experimental design would make 320 revolutions per minute. At this speed it is fair to assume that if the boiler supplied plenty of steam to the engine we could get a mean effective pressure of 60 lbs. per square inch and the engine would develop 1,756 h.p. Twenty-eight lbs. per horse-power-hour is a good average water rate for a simple engine of present designs. At this rate, the engine would require 49,168 lbs. of water per hour to be evaporated by the boiler, which is at the rate of 17.44 lbs. per square foot of heating surface per hour. Assuming that a pound of coal will evaporate 7 lbs. of water, it would be necessary to burn 7,024 lbs. of coal per hour, which is at the rate of 208 lbs. per square foot of grate surface per hour. These rates of evaporation and combustion are exceptionally high, and I doubt if they could be successfully maintained under service conditions.

However, I do not consider these valid arguments on which to reach the conclusion that the eight-wheel engine cannot be adapted to heavy, high-speed passenger service. As Mr. Chaney has suggested, the application of refined valve gears to well designed compound cylinders and the use of superheated steam would easily place the eight-wheel engine in the front rank of high-speed power, for the fact that the eight-wheel engine has less internal resistance than any other type has never been seriously disputed.

I think that it is entirely within the range of possibility to reduce the water rate of locomotives to 20 lbs. per horse-power-hour. At this rate Mr. Chaney's engine would only require the evaporation of 35,120 lbs. of water per hour. Assuming that by the application of a superheater the evaporative heating surface of the boiler was reduced to 2,400 sq. ft., the rate of evaporation would be 14.63 lbs. per sq. ft. of heating surface per hour. If 1 lb. of coal would evaporate and superheat 6 lbs. of water to steam at a pressure of 205 lbs. per sq. in. and a temperature of 500 degs. F., it would only be necessary to burn 5,853 lbs. of coal per hour, which is at the rate of 173 lbs. per sq. ft. of grate surface per hour. These figures are easily within the limits of past performances and no doubt could be attained without unduly increasing the back pressure to produce draft.

To accomplish the above results I would suggest that Mr. Chaney convert his eight-wheel engine to a three-cylinder compound, with a cylinder ratio of not less than 1:2.75, and clearance not more than 3½ per cent. of the high-pressure piston displacement and 2½ per cent. of the low-pressure piston displacement. Use one high-pressure cylinder placed on the center line of the engine and two low-pressure cylinders placed outside in the usual position on simple engines. Quarter the outside cranks and place the inside crank 135 degs. equidistant between the outside ones. This arrangement would give an engine nearly balanced as to reciprocating weights and would not be destructive to the track, even with the great weight of 120,000 lbs. on the driving wheels, four in number.

I would suggest a Pielock superheater with 418 sq. ft. of heating surface. This would leave 2,400 sq. ft. of evaporative heating surface in the boiler, which should be ample for the requirements of the engine. The high-pressure cylinder should be equipped with plug valves communicating through the cylinder ports with the high-pressure valve chest, so that when starting full boiler pressure could be admitted to the low-pressure cylinders; thus a starting tractive effort of 36,427 lbs. could be exerted, all of which could be utilized by the use of sand. After the engine is under headway, the adhesive weight of 120,000 lbs. should be sufficient.

I would suggest to Mr. Chaney that the Corliss steam distribution, or a close approximation to it, should be used on the high-pressure cylinder, while the valves of the low-pressure cylinders should work at full stroke at all times with a constant cut-off of about 85 per cent. of the stroke. With this arrangement compression could be adjusted to not exceed 4½ per cent. of the piston displacement in the low-pressure cylinders, while in the high-pressure cylinder the compression would vary with the point of cut-off from 5 per cent. to 2½ per cent. of the piston displacement. This would make it possible to reduce the cylinder clearance to the lowest possible volume and secure maximum economy in the use of steam.

I am firmly of the opinion that at some not far distant day some one will be found who will be progressive enough to take the retrograde step, which Mr. Chaney mentions, which will reveal to the engineering world the fact that the possibilities of the eight-wheel engine have not nearly been realized; at least, with respect to high-speed passenger service.

CHAS. F. PRESCOTT,
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THE ERECTION OF THE ST. PAUL'S MISSOURI RIVER BRIDGE.

BY J. H. PRIOR.*

The Chicago, Milwaukee & St. Paul recently completed the construction of a new bridge over the Missouri river at Mobridge, S. Dak., where this road connects with its Pacific coast extension, the Chicago, Milwaukee & Puget Sound. The bridge was designed and constructed by the bridges and building department of the road, under the direction of C. F. Loweth, engineer and superintendent of bridges and buildings.

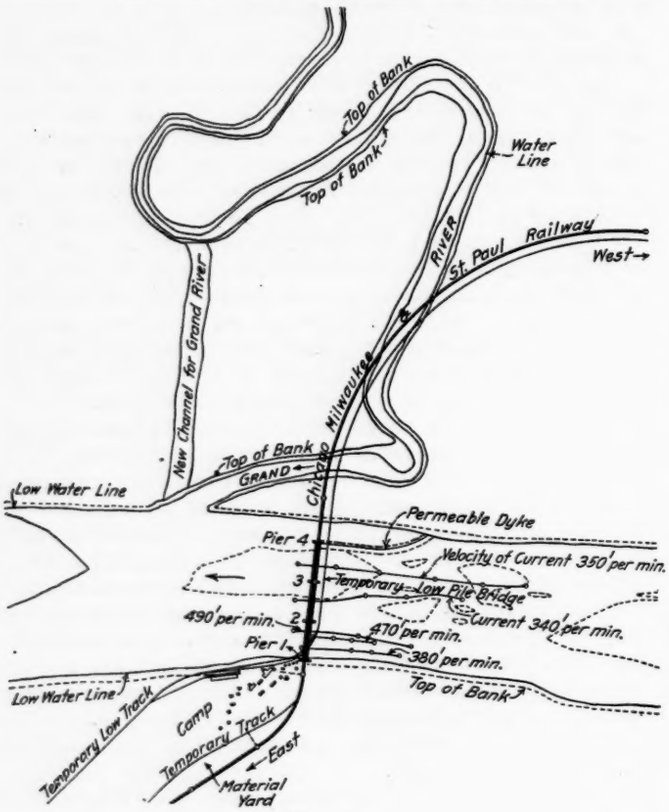

Fig. 1.

At the site of this bridge the low water channel has a width of 1,450 ft., which increases 100 ft. at times of high water. As an act of Congress required a clear headroom of 50 ft. above ordinary high water, the grade of the track on the bridge was placed at an elevation of 65 ft. 6 in. above low water. The bridge was designed for Cooper's E-55 loading per rail, and consists of three 420-ft. through pin-connected truss spans over the main channel, approached from the east by one 125-ft. deck span, and from the west by 283 ft. of steel trestle. A long wood frame trestle approach has since been partially, and will ultimately be wholly, replaced by an earth embankment.

In Fig. 1 the location of the bridge is shown and in Fig. 2 it is shown in outline. The abutment forming the east end is set back a safe distance from the water's edge, and the trestle at the west end is protected by a permeable dyke and woven willow mattress and stone riprap.

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ERECTION.

The 125-ft. deck truss at the east end and the 420-ft. main channel spans were erected on falsework by means of an ordinary bridge traveler, but no falsework was used for the erection of the steel trestle at the west end. A temporary pile bridge 90 ft. upstream from the permanent bridge, as shown in Fig. 1, was used to get material across the river for construction of the railway and to serve the construction work on the permanent bridge, although not most conveniently located for this second purpose. This pile bridge was in continuous use from the time the foundations were started until the main channel spans were swung clear of the falsework.

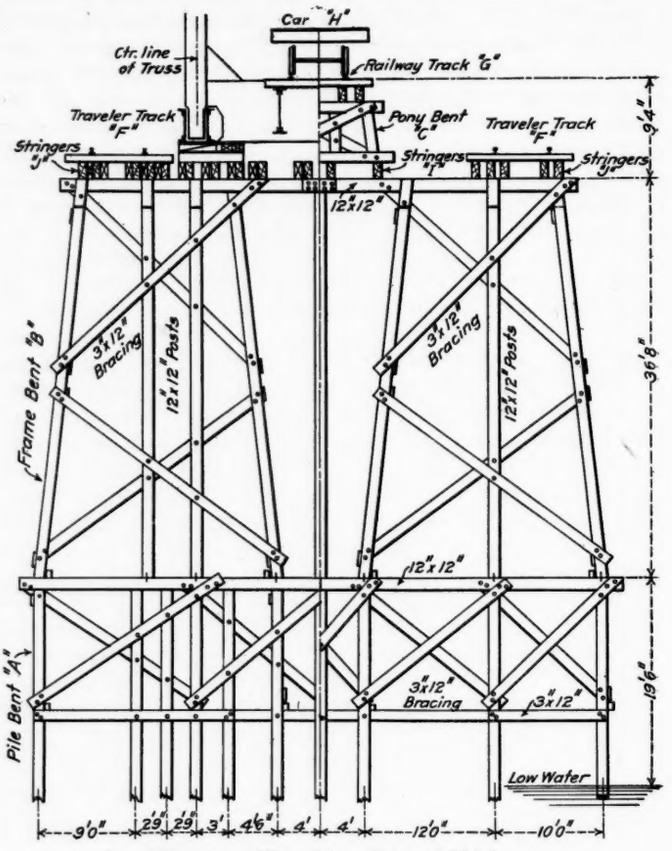


Fig. 3. (See Also Page 1410.)

The falsework for the main channel spans (Fig. 3) consisted of pile bents A, extending 19½ ft. above low water and supporting frame bents B, 36 ft. 8 in. in height, which in turn support the stringers carrying the traveler track and also the stringers carrying the pony bents which support the railway main track. Main bent E, located midway between panel points, carries the traveler and railway track only, and is of somewhat lighter construction, but consists of three stories similar to bent D.

Such of the pile bents A, which formed the lower story of the falsework, as were driven in the ground, which was above water and dry during their construction were driven by a track driver running on a temporary track which was

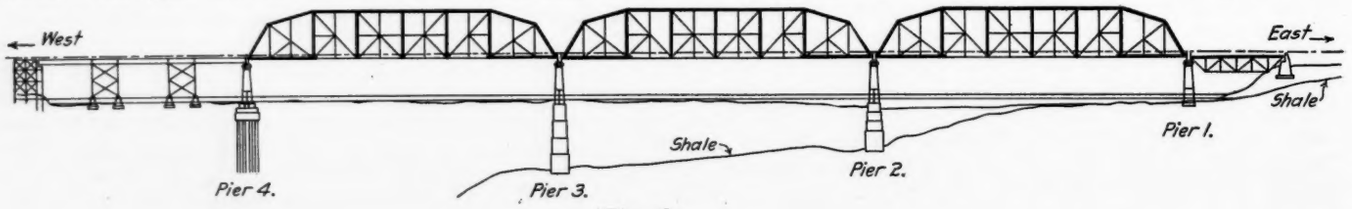


Fig. 2.

laid on the bents already driven, the track driver driving one bent in advance, piles being cut off and capped, and stringers and ties placed on the cap to permit the pile driver to move forward.

The piles for the falsework were carried out on the temporary pile bridge (Fig. 1) on push cars and rolled off into the stream at a point opposite where they were to be driven. The pile bents A (Fig. 3) were driven by a pile driver mounted on a scow, as shown in Fig. 4. On one side of the scow a longitudinal timber, A, was attached at a distance from the center of the leads which would give the correct

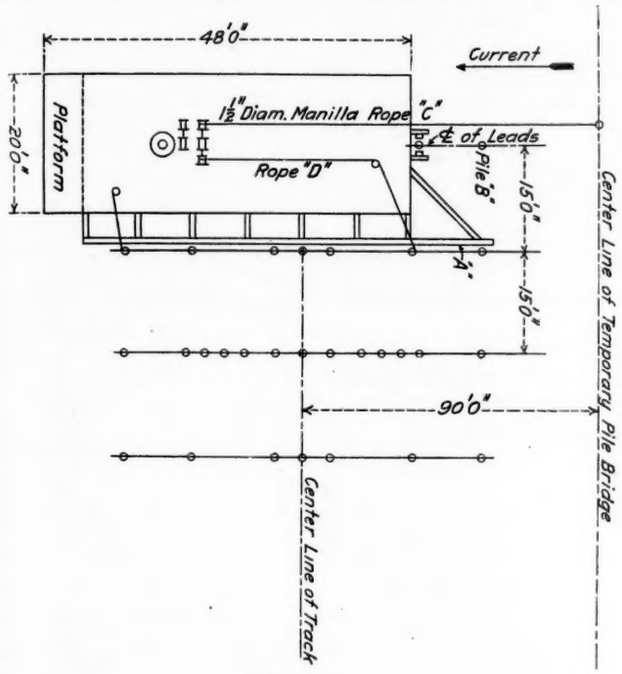


Fig. 4.

spacing of the piles from center to center of the pile bents. The scow was placed with this timber bearing against the piles in the last bent driven, and the pile, B, in the new bent driven. The driving of the remaining piles in the new bent followed, the scow being allowed to float down stream each time a distance equal to the spacing of the piles.

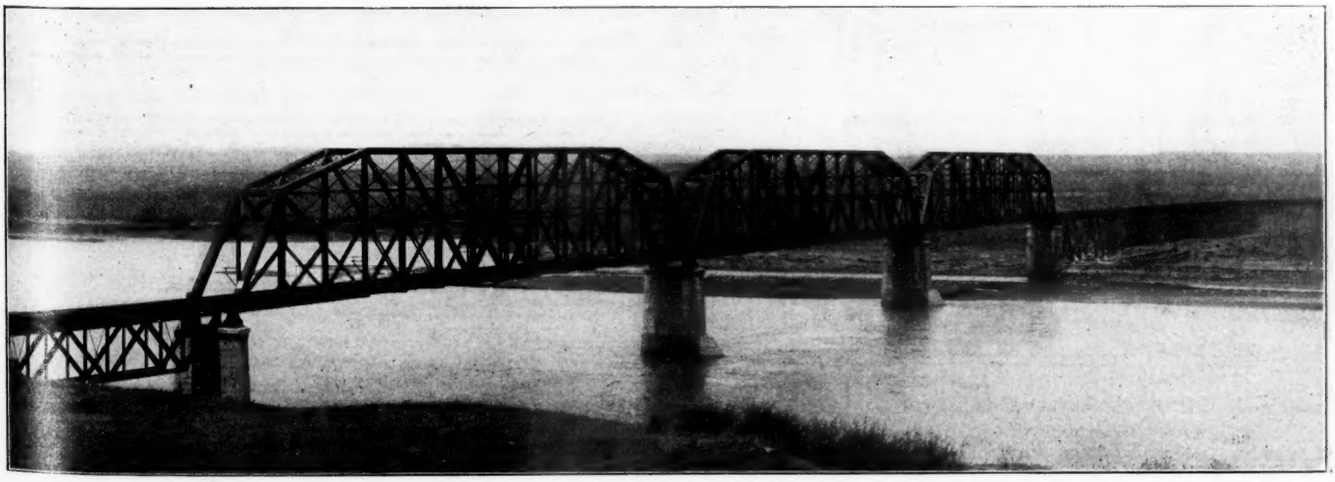
The frame bent B (Fig. 3) consists of nine 12 x 12 posts, the four outer posts on each side being braced as a unit and in such a manner that these four posts could be lowered from the track on the completed bents, A, with a derrick car and braced back to the finished portion of the falsework so as to support the stringers and track, thus completing a panel of falsework. The half-bents mentioned, consisting of four outer posts together with their bracing, were assembled to a template on a platform on shore, the platform being near enough to the track to be within reach of the derrick car, and were then picked up by the derrick car and carried out and put into place.

The piles for the falsework bents were driven from a scow in the manner just described, but the frame bents B for this portion of the falsework were assembled in a horizontal position on top of the pile bents and then erected into position by the derrick car, one panel at a time in advance of the completed portion of the falsework, the derrick car operating from the railway track which rested on the steel floor beams and stringers. In order to permit the derrick car to operate from the railway track it was necessary to carry on the erection of the steel floor fast enough to place the floor beams and stringers next to the end of the falsework structure as soon as the bents upon which they rested were erected. As soon as erected the bracing of Fig. 3 was placed, giving stability to the bent. The pony bents C were not used in this portion of the falsework, the derrick car being carried by the steel floor beams and stringers, each panel of which was placed as soon as the frame bents were raised into position. Although Fig. 3 is not a sketch of this portion of the falsework, it shows at D how the steel floor was placed from which the derrick car was operated. The material for this portion of the falsework was that which had been previously used in span I, and was now available, as span I had been erected and swung clear of the falsework.

The traveler which spanned the truss (Fig. 5) moved longitudinally on the traveler track F, Fig. 3 and Fig. 5. The railway main track G was supported by the pony bents C, Fig. 3 and Fig. 5, until the erection had proceeded to a point where the pony bents C, together with the stringers which they support, were removed, and the track placed with the steel stringers and floor beams of the permanent bridge, as shown at D and D1, Fig. 3.

As shown in Fig. 3, the bents are placed 15-ft. centers. This permitted of the use of the railway company's standard bridge material to a great extent without cutting, and made the second-hand timbers from the bridge only slightly less valuable than new material. It was possible to make the intermediate bents E of lighter construction than the bents D, at the panel points, as they carry only the traveler and the railway track, the dead load of the trusses being carried by bents D.

The traveler used in erecting the 420-ft. spans is shown in Fig. 5, and consists of three bents 85 ft. high, made long enough to erect one full truss panel of 60 ft., or two sub panels of 30 ft. each, without moving, and extending 3 ft. beyond the panel point at each end, in order to afford a plat-



Chicago, Milwaukee & St. Paul Bridge over the Missouri River at Mobridge, S. Dak.

form for the men while making the connections at three separate panel points.

The traveler was supported by a runway on each side consisting of two rails marked "Traveler Track F," shown in Fig. 5. A runway of two rails instead of one gave a wider platform for the engines, increased the stability of the traveler, and afforded a place for the men to stand while driving the pins, and a place for them to work when the main track G was loaded with cars. Fig. 5 shows an outline of the traveler, the detail drawings from which the material was ordered and the traveler was framed, being made in advance. The maximum load for which the traveler was designed was a top chord section which weighed 52,000 lbs.

The general arrangement of the traveler lines is shown on Fig. 5. Power was furnished by four 30-h.p. hoisting engines on the platform, two on each side. Each engine had two drums and three spools, as shown in Fig. 5 in a diagrammatic manner. Tie beams L, M and N are similar to the tie beam K. Tie beam K is carried by the stringers D, and has passed through it a U bolt E, which carries the blocks a and b, which are rove with six parts of ⅝-in. diameter steel cable, the lead line a, b, of which passes through a snatch block d at the top of the traveler, thence to the snatch block e at the bottom of the traveler and thence to the forward hoisting drum q of the engine. From the tie beams L and M (Fig. 5) are suspended four part tackles, a3-b3 and a2-b2, and are suspended in a similar manner to the tackles from the tie beam K, the lead lines a3-b3 and a2-b2, of which pass through the snatch blocks d and f respectively, at the top of the traveler, thence to the snatch blocks e and h, respectively, at the bottom of the traveler, and thence to the rear hoisting drums p and r of the engines, respectively. The blocks b1 and a1, suspended from tie beam N, have similar lines arranged, Fig. 5.

The tie beam K, in addition to transmitting the load in the tackle to the stringer D, acts also as a strut and prevents the lateral pull of the tackle when hanging at an angle with the vertical from overturning the stringer D, or pulling it laterally from its true position.

There are two runner lines from each engine which were used to raise some of the lighter members; such as the line m-n at T (Fig 5), which passes from the load which it is supporting to a sheave m, through a sheave n, through a sheave t, and thence to the winch head X on the engine.

In making the drawing Fig. 5, some minor details of the traveler were slightly changed to simplify the drawing, one 2-sheave block being shown at points D and N instead of the two 1-sheave blocks used at these points on the traveler.

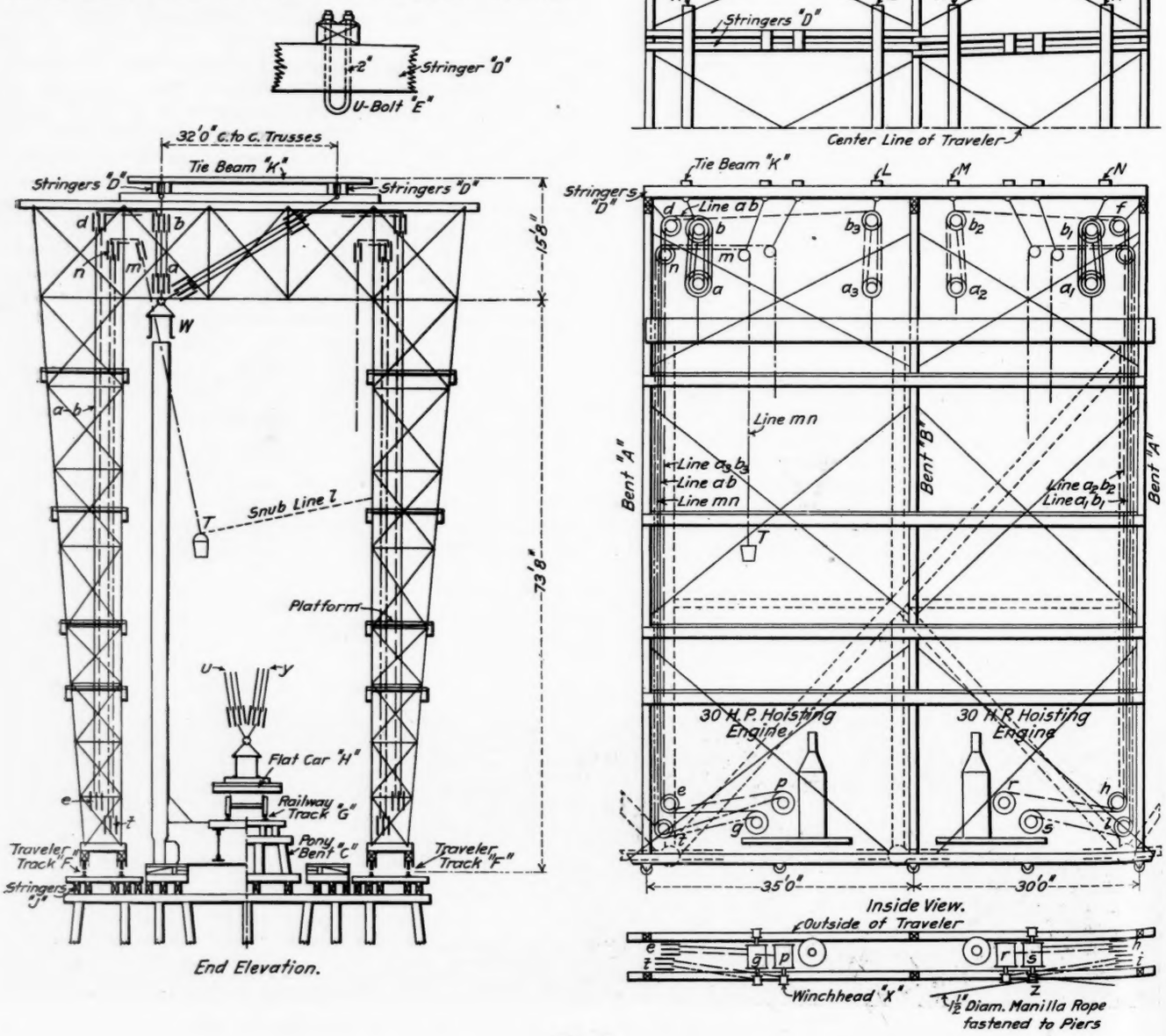


Fig. 5.

The traveler was only used for the erection of trusses, the floor system and bottom laterals having been put in with a derrick car. Fig. 5 shows the heavy top chord section being placed in its final position. The chord was run out on a flat car, H, to a point opposite its position in the truss. The tackles a-b to a3-b3 from the tie beams K, L, M, etc., were attached to the chord by a chain sling. The lead lines

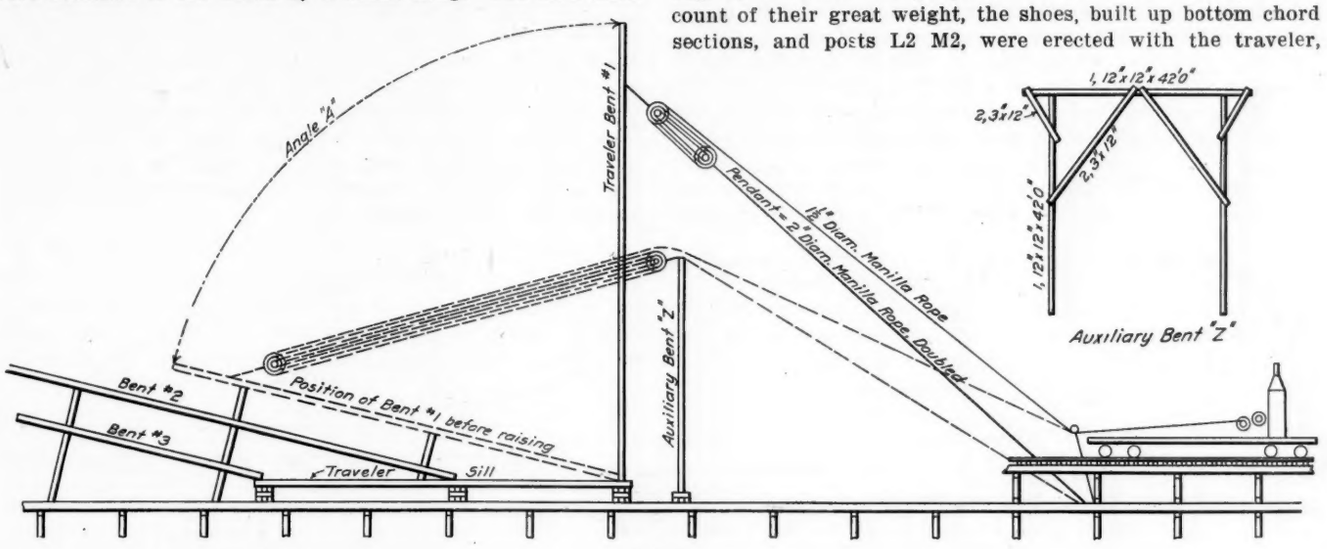


Fig. 6.

on all tackles were hauled in until the chord was lifted clear of the car. By increasing the velocity of haul of the lead lines of the tackles in position u over those in position y, the load is given a considerable lateral movement, bringing it to the position W at a low velocity, but remaining under control of the tackle y.

The lighter members were raised, as shown at T, Fig. 5, by means of a tackle from one side of the traveler only, and when raised from the car were prevented from swinging laterally with any great amount of force by the snub-line 1.

The traveler received its motion longitudinally by means of a line fastened to the piers at the ends of the span and containing enough slack to permit its being wound when required three or four times around one of the spools of the hoisting engine, as shown at Z.

Each bent of the traveler was framed in six sections on a platform on shore. These sections were carried out to a point on the falsework where the sills of the traveler had been previously placed and bolted together. The three bents were placed partly one above the other, as shown in Fig. 6, the feet of the bents being chained in their true position to the sills of the traveler, which in turn were fastened to the falsework. The first bent was raised by means of auxiliary bent, Z, 42 ft. high (Fig. 6), by means of the seven part block and tackle, one end of which was fastened to the top of the traveler bent and the other end of which rested on the top of the auxiliary bent, the lead line of which passed over the top of the auxiliary bent, thence down to a snatch block fastened to the falsework, and thence to a spool on the engine of the derrick car. The end of the tackle nearest the auxiliary bent was a three sheave block held by a double 2-in. manila pendant rope passing over the top of the auxiliary bent and fastened to the falsework. The bent was raised into position by hauling on the lead line, which caused the tackle to pull on the top of the traveler bent until it was revolved through the angle A to a vertical position. The second and third bents were raised in a similar manner except that the traveler bents already erected were used instead of the auxiliary bents.

The material yard was located, as shown in Fig. 1, about one-quarter mile from the east end of the bridge. The steel was shipped to the material yard from the shops in gondola cars as fabricated and unloaded by a derrick car. It was sorted and piled in the material yard as it was unloaded. The heavy material was unloaded on the temporary track at C, Fig. 1, and the lighter material was strung through a distance of a mile from A to B and beyond on both sides of the main track.

The 420-ft. spans were erected on the bents shown in Fig. 3, on which the pony bent C was used. First, on account of their great weight, the shoes, built up bottom chord sections, and posts L2 M2, were erected with the traveler, the material being carried out on flat cars running on the railway track G, Fig. 3, which rested on the pony bents C, then lifted from the flat cars and placed in their proper location by the traveler tackles a-b to a3-b3, Fig. 5, in the manner previously described for the top chord. Following

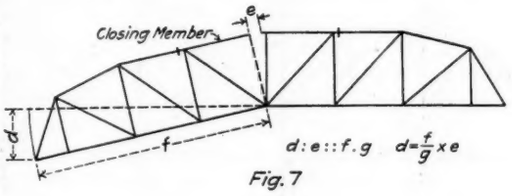


Fig. 7

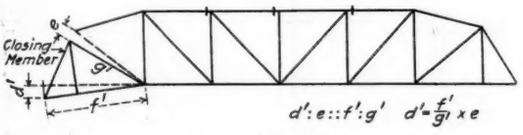
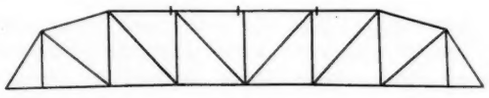


Fig. 8.



B.

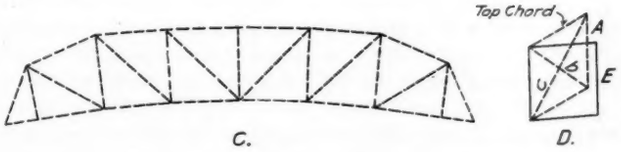


Fig. 9.

this the floor system and bottom laterals were put in by a derrick car. In order to place bottom laterals and floor beams, the pony bents C and stringers L of Fig. 3, just in advance of the portion of the floor already placed and occupying approximately the position of the steel floor beams and stringers about to be erected, were removed by derrick car, No. 1, Fig. 3, which had been backing away from the por-

tion of the structure already erected. This derrick car No. 1 removed the temporary floor in advance of the portion of the steel work about to be erected and placed the material from the temporary floor upon the falsework alongside, where it could be picked up and carried off the structure when the floor was connected. After derrick car No. 1 had removed the panel of temporary floor immediately in front of it, it moved backward and picked up the next panel of floor to the west. Simultaneously with this, derrick car No. 2, Fig. 3, had been operating as follows: A load of floor beams and stringers were pushed out on a flat car in front of the derrick car and unloaded on the falsework alongside of the track as near as possible to their final position longitudinally. The flat car in front of the derrick car was then pulled out and the derrick car returned and placed the floor beams and stringers, which it had just unloaded, in their final position.

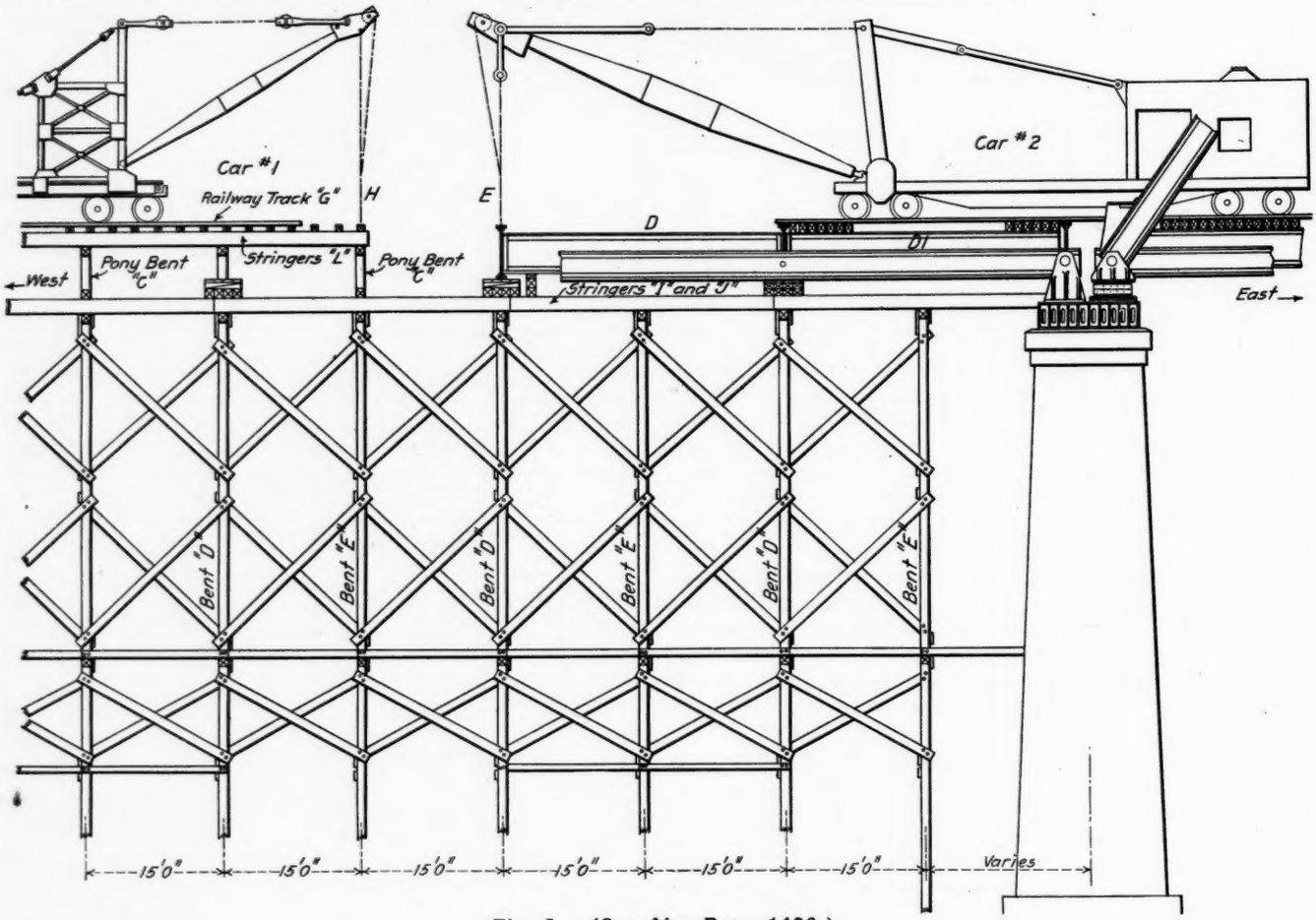


Fig. 3. (See Also Page 1406.)

During the entire time that the floor system and bottom laterals were put in by a derrick car, the gap or the break in the track between points H and E, Fig. 3, was open. After the floor beams, stringers and bottom laterals were placed, the track was restored and all material erected from this stage onward was brought out under the traveler on cars.

The steel floor having been placed, the end connections of the floor beams formed a convenient support to which all vertical posts could be fastened and be made secure without much guying. These posts, together with the other web members and the remainder of the bottom chord, were next erected in the following manner: Enough material for one full panel of bottom chord and web members was run out at one time on flat cars on the railway track G, Fig. 3 and Fig. 5, and erected by the traveler. Pins were then driven, except top chord pins.

Starting with the center of the span and working to the east end, the top chord section, batter posts and top struts were put in, the pins being driven as the several panel points were reached. The traveler was then started back to the center of the span putting in the top laterals and completing the sway bracing of the span which it has just erected. The movement of the traveler continued past the center of the span to the west end, erecting the remainder of the top chord, batter posts and bracing. The pins were driven with a steel ram 6 in. in diameter by 16 ft. long, and weighing 1,600 lbs., suspended from the top of the traveler and operated by men working from whichever platform in Fig. 5 was just below the pin to be driven. All bottom chord splices were riveted before the span was swung, and all other connections were riveted after the span was swung. Two crews of nine men each were used on this traveler, one crew on each side. An average of about 14 days was required to erect each span, counting from the time that the first work was done in placing the shoes until the span was swung clear of the falsework.

On account of the danger of the approaching high water, the erection of the steel followed closely on top of the erection of the falsework. One derrick was either employed in upending the frame bents B, Fig. 3, which were assembled on tops of the pile bents A below or else was employed in placing the stringers. As soon as the panel of falsework had been completed this car moved back to pick up and place the steel floor beams and stringers necessary to complete the panel. In this way the erection of the falsework and the erection of the steel upon it were carried on practically simultaneously.

The end posts on the end top chord section at one end were the last members of the truss to be erected as previously described. This was due to some features of camber blocking shown in Figs. 7, 8 and 9. In Fig. 9, in full lines at B, is shown an outline of the truss when subjected to the dead load of its own weight. In dotted lines at C is shown to an exaggerated scale an outline of this truss when resting on the camber blocking, each panel being distorted, as is shown in dotted lines, and to an exaggerated scale at D in

such a manner as to make the diagonal distance b less than the diagonal distance c and less than the true fabricated length of the member which will be located in the diagonal b. It is a simple matter to give each panel the shape shown at A by means of camber blocking, as the rectangle, the top and bottom of which are formed by the top and bottom chords respectively and the sides of which are formed by posts, approximate a four-sided figure each side of which consists of a stiff member but which is hinged at the corners. As the length of the diagonal distance b is less than the member occupying this position, by decreasing the amount of camber blocking, the panel at A can be brought toward a position shown by light lines E in which the distance center to center of end pins on diagonal b is exactly equal to the distance center to center of end pins of the member which occupies this position in the structure. Allowance is, of course, made for the conditions of sag, temperature, etc., under which the member is being erected.

This use of the camber blocking permits making the necessary adjustments so that all members of the truss can be erected except the closing side. If the center section of top chord, Fig. 7, is chosen for the closing member any error between the fabricated length of the top chord and the space left for it in the truss in amount equal to e would make it necessary to alter the elevation of truss by the amount d equal to $\frac{f \times e}{g}$, but if the end post is chosen as a closing member the total amount of vertical movement required for a similar error of like amount is shown in Fig. 8 to be $\frac{f' \times e}{g}$ or about 3/5 of the foregoing. An advantage is also obtained through the pin connection at either end of the end posts which permits of the use of the large force available from a pilot nut driven by a ram to force the last member into position. The steel trestle approach at the west end, for which no falsework was built, was erected as follows:

As the bridge was erected from the east toward the west, it was necessary to carry the material for the steel trestle through the 420-ft. spans. As the portals and the transverse bracing for these spans limited the clear head room, it was impossible to bring out columns for the steel trestle suspended from the boom of the derrick car, without fouling the transverse bracing of the trusses. Two columns, therefore, were loaded on a flat car which was pushed out ahead of the derrick car to a point near the west end of span III, adjoining the trestle approach. The columns were then lifted from the car by the derrick car boom, one column being placed each side of the track resting on the floor beams, as there was sufficient room to store these in this position for a few hours. Following this, two panels of transverse bracing for one bent and laterals for one girder span were loaded on a flat car in the same manner, pushed out and unloaded on a few temporary timbers laid from the top flange of the stringers to the bottom chord of the truss. The lateral bracing for one girder span which had been placed on the same car with the transverse bracing for the bents was unloaded by being merely thrown from the car onto the track between the rails. The members being light and containing no large projecting gusset plates, their position between the rails did not effect the clearance for cars moving over them.

The flat car was then pulled in the clear, the derrick car returned and picked from its position one column, to the top of which had been fastened longitudinal and transverse guy lines. The derrick car moved forward with the column at the end of the boom on the portion of the structure already completed, the length of the boom, 80 ft., permitting it to place the column a full span in advance of the completed portion of the structure. The remaining column of the same bent was placed in a similar manner and the two upper panels of transverse bracing were placed by being carried out on the boom of the derrick car and lowered by runner line into place.

THE SUCCESSFUL LOCOMOTIVE MECHANICAL STOKER: PENNSYLVANIA LINES WEST OF PITTSBURGH.

For the past ten years or more it has been generally recognized that a mechanical stoker for locomotives was desirable, because of the increasing demands made on the strength and endurance of the fireman by the growing proportions of the motive power. With the advent of the Mallet locomotive, what was desirable before becomes an absolute necessity, if this type of power is to be used in road service. For, as was recently pointed out in the *Railway Age Gazette* in a note on the performance of the Mallets on the Erie Railroad, no human being has the strength to fire one of those machines over a long division, if it is worked to capacity.

With this incentive a number of stokers have been developed and put on the market. They have succeeded in doing the main thing for which they were designed; that is, maintain the steam pressure on a run where the engine was worked with the usual trains and speeds. But they have failed, so far as any data that has been made public indicate, in two other essentials of prime importance. They have not only failed to show any economy in comparison with hand firing, but they have developed an excess of coal consumption. Then, they have failed to suppress smoke. In fact, no hand firing would be permitted that could not do the work with less.

With these general conditions and results before him, D. F. Crawford, general superintendent of motive power of the Pennsylvania Lines West of Pittsburg, attacked the problem. His first step was to analyze the conditions obtaining in hand firing. The coal is spread or laid on the top of the incandescent mass beneath, with the result that the volatile gases are immediately driven off, and a cloud of black smoke is emitted from the stack. If the same system is followed with a mechanical stoker the trouble with smoke is simply exaggerated. The machine, not possessing the intelligence of the man, will simply persist in scattering the coal, and green coal must necessarily fall upon that which is still unignited, increasing the density of the smoke and the corresponding waste of heat units in the unconsumed gases.

It therefore seemed desirable in the development of a new type of stoker to so arrange the distribution of the coal upon the grates that this excessive development of smoke, with the resultant waste of heat, would be avoided. In short, it was planned to have the stoker utilize the contained heat of the coal to the utmost and, to do this, it must work under practically smokeless conditions.

In addition to these theoretical or chemical requirements, as they might be called, it was decided that the stoker must do all of the work, from the tender to the firebox. And as it was to do this, it was laid down as an essential requisite that it should be built in so as to form an integral part of the locomotive itself and not be a mere appendage that could be detached and thrown to the ground in case of failure or breakage; while at the same time it should in no way obstruct the regular firedoor, but the latter could be used at once, as usual, in case hand firing became necessary for any reason.

Further, the development of design must be such that it can be readily applied to existing locomotive equipment without radical and expensive changes, not only to facilitate the application, but also to obtain immediate results in case the design meets the exacting requirement.

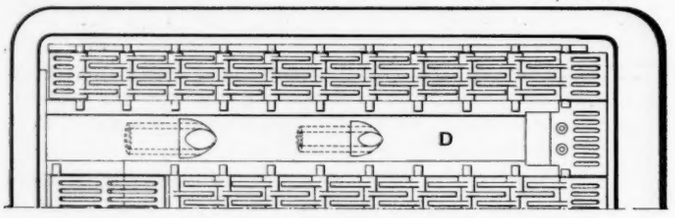
Starting in with the chemical aspects of the case, the only available means of distilling the gases and raising them to the ignition temperature before they could escape into the tubes was along the lines of the underfed stoker. This was a revolutionary innovation, but as it offered the surest solution of the smoke difficulty as well as giving promise of economical results, it was chosen and work started along these lines.

The problem as laid out, then, was to produce a mechanical stoker that should maintain the desired steam pressure under

all conditions of working of the engine; should be practically smokeless, and should show an economy of fuel consumption that, if not exceeding or equaling that of the best hand work, should be better than the average; or, even better than the average of the most skilful man, when his lapses due to fatigue and long runs are taken into account.

The problem stated and the method planned, it remained to develop a mechanism to do the work. The only precedent was the underfed stokers of stationary work. They were tried and failed in the great requisite of maintaining the steam pressure. Then followed a long period of experimenting, which space does not permit following, and which would be of interest solely as an exhibition of the steps that were taken and the reasoning that was applied until a machine was developed that could be depended upon to do all of the stoking from the time an engine left the roundhouse until it was run over the cinder pit at the other end of the division.

If the fireman were to be spared it was quite as essential that a conveyor should be provided to take any grade of coal from the tender and deliver it to the stoker as that the latter should be able to put it into the firebox in the proper manner after it had received it. Hence it was a part of the plan to design a conveyor that could be built in so as to form a part of



Half-Plan of Grate Used with Crawford Locomotive Mechanical Stoker.

the locomotive and not obstruct the fireman should hand firing at any time become necessary.

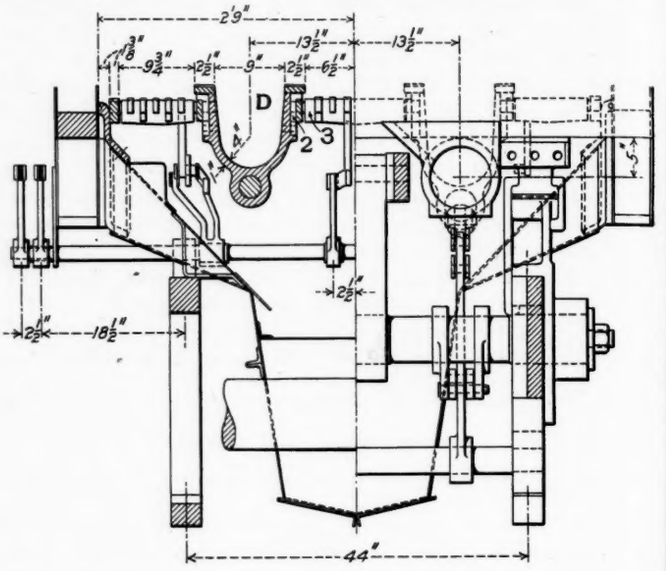
After several years of work a stoker has been evolved that meets the requirements outlined above.

Skipping the intermediate steps we come to the machine in its latest stages as applied to a consolidation locomotive of the Pennsylvania Lines West. This locomotive is of the Pennsylvania H6b class, and of the following general dimensions:

Diameter of cylinders	22 in.
Stroke of piston	28 in.
Weight on drivers	179,000 lbs.
Weight on engine	202,000 "
Steam pressure	205 "
Heating surface, firebox	166.5 sq. ft.
" " tubes	2,677 "
" " total	2,844 "
Size of firebox, inside	66 x 107 in.
Grate area	49.04 "
Diameter of drivers	56 in.
Tractive effort on 85 per cent. boiler pressure	42,168 lbs.

This engine is now run in regular service, with the various tonnage loadings belonging to its class, on the divisions over which it is worked.

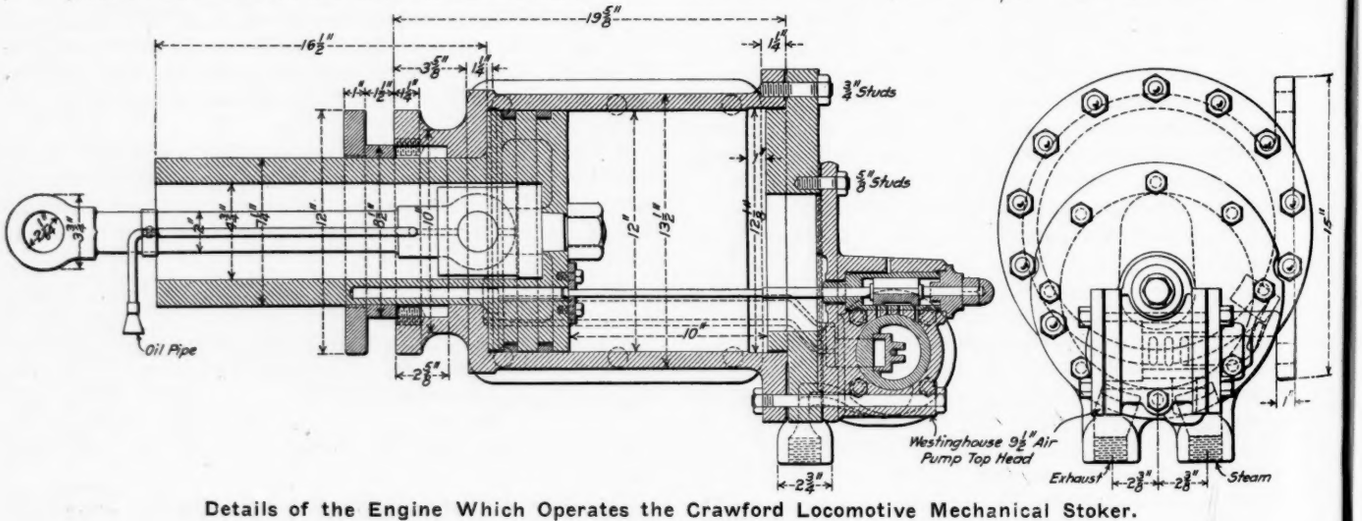
A person looking for a change in the appearance of the engine due to the application of the stoker would be disappointed. There is nothing to indicate that the stoker has been put on, with the exception of a large cylinder bolted to the back end of the frames on the fireman's side. And even that might very readily be mistaken for a driver brake cylinder. This cylinder has a diameter of 15 in. and a piston stroke of 10



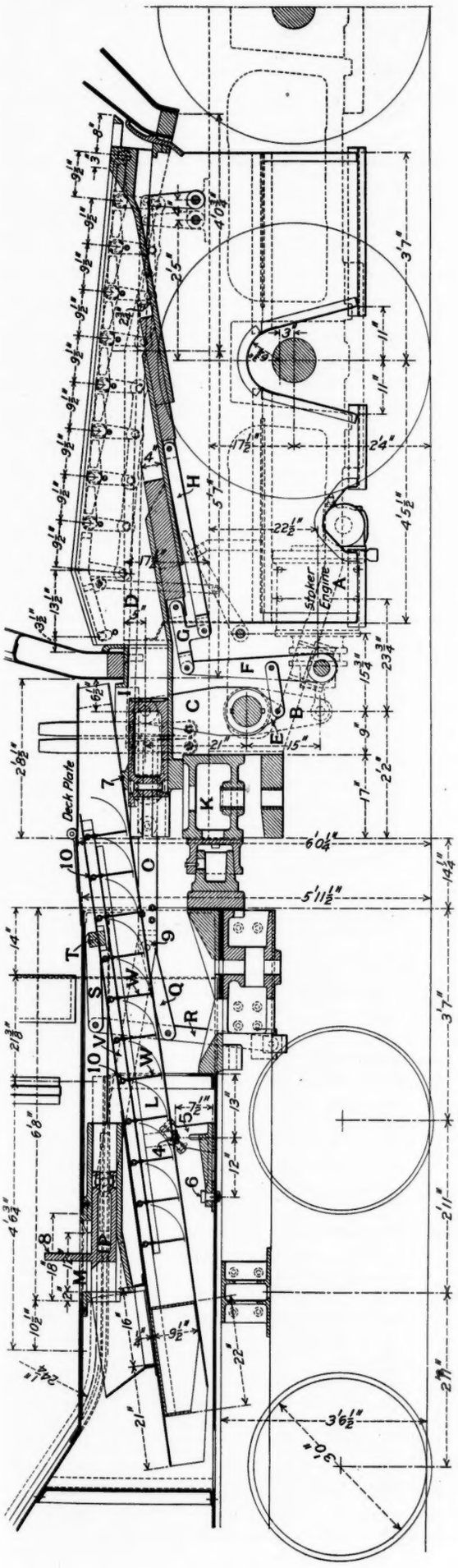
Cross Section Showing the Arrangement of the Crawford Locomotive Mechanical Stoker.

in. The piston rod, which is of the trunk type, with a pivoted connection, takes hold of the lower end of a heavy rocker arm B, shown in the diagrammatic engraving.

The piston of the stoker cylinder or engine works back and forth as in any engine and is operated by the ordinary valve motion of the Westinghouse 9½-in. air pump. The method of construction is clearly shown in the engraving. The piston is made with a trunk to serve as a guide and thus shorten the connections. The valve head is set off on one side so that the reversing stem will enter a hole drilled in the wall of the trunk in which it is to play. All of this is standard Westinghouse construction, even to the tappet plate against which the button of the reversing stem strikes. The advantage of using a reversing mechanism that has been worked out and which is carried in stock, so that in case of failure a replacement can be drawn and applied, is apparent.



Details of the Engine Which Operates the Crawford Locomotive Mechanical Stoker.



Crawford Locomotive Mechanical Stoker and Coal Conveying Apparatus.

In the cab the firedoor is as free to be used as on any locomotive, and the only changes to be seen are two openings, like scuttles or hatches, through which coal can be shoveled to the stoker in case of the failure of the conveyor. These are covered by lids and offer no obstruction to any work to be done. The shaft of the rocker is carried in heavy cast bearings bolted to the frames, and at the center there is attached the upper arm C, which actuates the stoker proper, and the conveyor. This arm projects up between the two conveyor troughs. The arrangement of these is shown in the cross-section and the plan. From these engravings it will be seen that there are two troughs set 27 in. apart from center to center and at equal distances on either side of the center of the firebox. They have a width of 9 in. and a total depth of 20 in. or 18 in. below the bottom of the grate at the back. These hoppers D are of cast iron and have a projecting lip 1, reaching out over the air space 2, between the wall and the grate. This lip is an example of the close attention to detail that has been demanded in the development of the mechanism. It was not used on the present design, but, on a design now under construction, has been provided to prevent the loss of such quantities of unconsumed fine coal as dropped down through the space 2. It has developed that there was the same opportunity for loss down through the space 3, but by properly proportioning the width of the grate fingers to the air inlets in combination with the movement of the coal across the hot plate cokes it and causes it to agglutinate so that the pieces are too large to be lost, and this source of waste is entirely obviated.

The trough D extends from a point about 24 in. back of the firebox, forward and upward to the dead grate at the front. Its depth, therefore, decreases from 20 in. at the back end to nothing at the front.

In the bottom of the trough are cast two recesses which are now cylindrical, but which it is intended to make rectangular. They serve as sheaths into which the plungers withdraw on the backward stroke.

As the upper rocker arm has a length of 21 in. as compared with 14 in. for the lower arm, the stroke of the main back plunger, which has a diameter of 8 in., is 15 in. The forward and intermediate plungers are 4 in. and 2¾ in. in diameter, respectively, but will be made rectangular 3 in. x 2½ in. and 4 in. x 3 in. They are moved in the opposite direction to that of the main plunger. That is to say, when the latter is moving forward they are moving back and *vice versa*. This reversal of the motion is accomplished by using a downwardly projecting rocker arm E, connected to a lever F, which is pivoted at its lower end and is coupled at its upper to the two smaller plungers by the bars G and H.

It will be seen, then, that so long as the stoker engine is at work the plungers are moving backward and forward, pushing the coal in front of them to the forward end of the trough. But as they progressively decrease in size from the back to the front there is a corresponding decrease in the amount of coal moved. Here, too, a good deal of experimental work had to be done.

As it is, there is a nearly uniform bed over the whole of the grates, and the whole upper surface is kept aglow. The grates proper are in three sections. They are of the ordinary finger pattern, as shown on the plan, and occupy the areas between the troughs and the sides of the firebox, as well as that between the troughs themselves. The coal thus rises up and falls out on the grates, and in the designs under construction passes over the plates 1, which are renewable. The actual operation will be taken up later.

Thus much for the stoker proper. It is a complete mechanism in itself and can be operated with any means of coal delivery. That used, however, is an intermittent conveyor, which delivers the coal at I, in front of the main stoker plunger. With the conveyor there is also combined a crusher that breaks the larger lumps of coal into a proper size for

DAILY TRIPS OF ENGINE EQUIPPED WITH STOKER.

Date.	Train: Tons.	Loads.	Empties.	Rate.	Time, hrs., min.: Total.	Running.	Loco. deten.	Av'ge.: Stm. press.	Speed.	Fire, approx.: Hook'd.	Shak'n.	Stoker fire, per ct.	Smoke.	Remarks.	Miles
Jan. 25, 1910	885	21	..	Fast freight.	4:23	3:45	..	197.6	26.0	25	9	96[1]	.....	Low tonnage; lack of frt.	
" 27, 1910	990	27	..	Fast freight.	3:35	3:21	..	202.5	29.1	10	9	100	Bet. 2 & 3.	Good run of mine coal.	
" 27, 1910	990	27	..	Fast freight.											
" 28, 1910	2,163	32	13	13 T. over A	6:30	5:00	..	196	19.5	41	35	100	.....♂	Poor coal.	
" 28, 1910	1,461	22	13	14 T. less A.											
" 29, 1910	1,300	3	50	A	7:11	5:36	..	193.3	17.3	17	16	93[2]	.....	Front sec. pan filled up.	
" 29, 1910	2,000	15	50	A											
Feb. 1, 1910	1,074	28	..	Fast freight.	4:28	3:44	..	201	26.2	10	16	100	.....♂	Stkr put too much ahead	
" 2, 1910	2,113	21	17	37 T. less A.	6:35	5:11	..	196.6	18.8	24	28	100	.....♂	Cnveyr not hndlg enough.	
" 2, 1910	1,469	23	10	7 T. less A.											
" 3, 1910	1,245	..	50	55 T. less A.	9:03	6:33	7	191	14.9	46	41	90[3]	.....	Hand firing did not help pressure.	
" 3, 1910	1,986	4	64	14 T. less A.											
" 4, 1910	2,090	31	..	10 T. less A.	6:40	5:11	..	202.5	18.8	25	39	100	Considrble	Good coal; plenty steam.	
" 4, 1910	1,474	23	..	A											
" 5, 1910	1,270	25	2	30 T. less A.	6:50	5:11	..	190.4	18.8	38	38	93[4]	Lrge amt.	Too much coal in box.	
" 5, 1910	2,000	37	9	A											
" ‡6, 1910	1,230	31	..	Fast freight.	....	....	..	Good.		12	11	100	.....	Shkr br. caught in plungr	
" 7, 1910	1,150	25	2	....	7:20	5:34	..	198	17.5	28	25	100	Lrge amt.	Knees on conveyor broken, fire thin ahead.	
" 7, 1910	2,000	42	4	A											
" 8, 1910	1,000	25	8	....	4:50	3:56	..	194	24.8	23	22	100	.....♂	Fire clinkered once; good at end of trip.	
" 9, 1910	1,264	3	48	36 T. less A.											
" 9, 1910	2,000	6	59	A	7:00	4:41	..	198.5	20.9	28	37	100[5]	.....△	Coal brns fster thn Pitts	
" 9, 1910	560	6	11	....											
" 10, 1910	2,025	38	3	About B. ..	7:16	5:20	..	195	18.3	39	44	100	Very little.	Back grate stuck.	
" 10, 1910	1,475	27	3	A											
" 11, 1910	1,000	..	45	....	9:52	7:19	..	180	13.3	22	33	75[6]	.....	Clinkered; too much hkg.	
" 11, 1910	1,845	15	45	....											
" 14, 1910	1,225	4	45	75 T. less A.	9:45	5:54	26	180	16.5	37	46	92[7]	.....	Clinkered at center.	
" 14, 1910	1,977	14	52	23 T. less A.											
" 15, 1910	2,135	40	4	15 T. less A.	7:19	5:32	..	201.9	17.6	42	41	100[8]	Lrge amt.	Bk grates stk; good trip.	
" 15, 1910	1,463	28	2	12 T. less A.											
" 21, 1910	1,264	31	..	Fast freight.	6:52	5:02	..	195	19.4	40	30	98[8]	.....	Aux. plgr red. to 2⅞ in.	
" 22, 1910	2,148	30	22	....	7:45	5:37	10	185	17.3	30	44	100[5]	.....	Conveyor out of order; too much coal ahead.	
" 22, 1910	1,463	19	22	....											
" 23, 1910	1,255	..	51	....	8:55	6:21	5	180	15.3	19	31	100	.....	Conv. out of order, back.	
" 23, 1910	1,500	4	52	....											
" 24, 1910	1,756	26	19	21 T. less C.	6:49	5:07	..	202	19.1	10	21	53[9]	.....	Pin, plunger to cross arm raised out of place.	
" 24, 1910	1,331	18	19	6 T. less B.											
" ‡25, 1910	...	..	..	Fast freight.	....	....	..	200	....	5	7	100	.....	Good trip.	
" ‡26, 1910	2,125	47	..	A	....	5:45	..	200	....	18	17	100	.....		
" ‡26, 1910	1,475	32	..	A											
Mar. 1, 1910	1,000	10	37	300 T. less A	7:10	5:03	10	197.4	19.3	29	34	100	Not much.	Conveyor in shop; good trip for steam.	
" 1, 1910	1,973	27	38	23 T. less A.											
" 2, 1910	965	25	..	....	4:04	3:38	10	200	26.9	10	20	100‖	.....♂	Too much coal ahead; good trip.	
" 3, 1910	1,280	34	..	20 T. less A.	5:49	4:26	..	200	22.0	19	29	100	Fair.	Front plunger reduced; good trip for steam.	
" 3, 1910	1,543	32	10	¾ of A.....											
" 4, 1910	2,169	34	9	19 T. plus A.	6:52	4:35	..	202	21.3	6	25	100	None.[17]	Lower flue stopped up; good trip.	
" 4, 1910	1,463	23	8	13 T. less A.											
" 5, 1910	1,290	8	39	10 T. less A.	7:15	4:42	20	198	20.8	23	27	100	.....	Ash pan filled up.	
" 5, 1910	2,000	24	49	400 T. less A											
" 9, 1910	1,220	.	48	Fast freight.	....	....	..	...	....	..	..	...	.....	Not full trip; lack frt.	
" 10, 1910	1,300	30	6	A	6:25	4:52	..	198	20.0	31	30	98[10]	.....♂	Good trip.	
" 10, 1910	1,462	32	6	538 T. less A											
" 11, 1910	2,140	41	5	10 T. less A.	7:53	5:42	6	196	17.3	24	36	96[11]	Considrble	Good trip when stoker ran.	
" 11, 1910	1,458	29	..	15 T. less A.											
" 15, 1910	2,130	34	..	20 T. less A.	6:23	4:54	..	202	19.9	26	18	66[12]	.....	Conveyor out of order; handlingtoo much coal	
" 15, 1910	1,474	23	..	A											
" 16, 1910	1,239	27	1	61 T. less A.	6:12	4:56	..	195	19.8	35	31	100	No. 2-3 av.	Conveyor did not furnish quite enough coal.	
" 16, 1910	1,995	21	27	5 T. less A.											
" 17, 1910	2,150	38	5	A	6:50	5:02	..	200	19.3	27	40	100	Considrble	Fine trip for steam.	
" 17, 1910	1,475	27	55	A											
" ‡18, 1910	1,280	27		A	7:05	4:57	..	Good	20.0	19	26	100[13]	.....	Part front grate blocked.	
" ‡18, 1910	1,957	52		A											
" ‡19, 1910	1,470	38		Fast freight.	6:04	5:31	..	Good	18.0	21	20	100	.....	Good trip.	
" ‡19, 1910	1,470	..		....											
" ‡20, 1910	1,296	35		Fast freight.	5:25	4:25	..	Good	23.5	19	26	100	.....	Good trip.	
" ‡20, 1910	1,296	..		....											
" ‡21, 1910	900	28		Fast freight.	3:35	3:27	..	Good	31.0	14	18	90[14]	None.	Good trip.	
" ‡21, 1910	900	..		....											
" 25, 1910	2,000	..	79	A	9:04	5:43	30	190	17.5	35	44	97°	Less thn 1		
" 25, 1910	2,000	..	79	A											
" 26, 1910	2,130	45	..	A	6:11	5:00	..	199.5	19.8	14	29	100	Less thn 1	Fine trip.	
" 26, 1910	1,458	31	..	A											
" 29, 1910	1,300	..	58	A	8:48	6:15	..	199.5	15.7	27	36	94°	Less thn 1		
" 29, 1910	1,997	11	58	A											
" 30, 1910	2,154	33	22	A	7:34	5:38	..	200.4	17.5	12	19	94.4°	Less thn 1		
" 30, 1910	1,478	31	4	A											
" 31, 1910	1,998	15	51	A	6:46	5:38	..	197.8	17.8	24	26	92.3[15]	Ave., .47.		
" 31, 1910	1,998	15	51	A											
April 1, 1910	2,112	38	..	A	6:41	4:42	..	200.9	21.0	18	27	100	Less thn 1		
" 1, 1910	1,479	26	..	A											
" 2, 1910	1,918	48	..	A	7:37	4:47	..	200.8	20.4	18	24	100	Less thn 1		
" 2, 1910	1,918	48	..	A											
" 3, 1910	1,208	38	..	Fast freight.	4:32	3:51	..	197.8	25.8	20	24	100	Ave.. .42.		
" 4, 1910	1,974	12	46	A	6:52	5:30	..	199.5	17.7	30	39	100	.....		
" 5, 1910	1,125	20	13	C	5:07	4:16	..	199.5	23.2	21	28	100	.....		
" 7, 1910	2,151	40	14	A	8:47	6:08	..	198.5	16.1	35	39	100[16]	.....		
" 7, 1910	1,478	26	12	A											
" 8, 1910	1,300	35	..	Fast freight.	4:30	4:05	..	200	24.8	10	12	100	Low.	Col. to Denn.	100
" 9, 1910	2,150	33	12	A	8:00	6:55	..	195	14.1	25	20	100	"	Denn. to Col.	100
" 9, 1910	1,475	33	..	A											
" 10, 1910	950	25	..	Fast freight.	4:40	4:15	..	200	23.0	11	12	100	"	Col. to Denn.	100
" 11, 1910	2,150	38	17	A	7:03	4:57	..	200	19.8	28	29	100	"	Denn. to Col.	100
" 11, 1910	1,465	24	11	A—10T....											
" 12, 1910	...	..	..	....	Stoker meeting at Col.										

Date.	Train: Tons.	Train: Loads.	Train: Empties.	Rate.	Time, hrs., min.: Total.	Time, hrs., min.: Running.	Time, hrs., min.: Loco. deten.	Av'ge.: Stm. press.	Av'ge.: Speed.	Fire, approx.: Hook'd.	Fire, approx.: Shak'n.	Stoker fire, per ct.	Smoke.	Remarks.	Miles
" 13, 1910	1,260	20	..	Fast freight.	7:25	5:33	..	200	17.6	29	17	100	Low.	Col. to Denn.	100
" 13, 1910	1,250	22	..	Fast freight.											
" 14, 1910	1,100	40	..	Fast freight.	5:10	4:25	..	188	21.1	14	15	100*	"	Denn. to Col.....	100
" 15, 1910	1,280	33	..	Fast freight.	7:24	4:58	..	197	19.7	20	17	100	"	Col. to Denn.	100
" 16, 1910	2,150	59	..	A	8:10	6:50	..	200	14.3	20	24	100	"	Denn to Col.	100
" 16, 1910	1,475	40	..	A											
" 21, 1910	1,290	24	..	A	7:50	6:39	..	200	14.7	15	9	100	"	C. to D.; fine trip	100
" 21, 1910	2,000	24	25	A											
" 22, 1910	1,000	32	..	Fast freight.	9:14	4:58	..	198	19.9	17	10	100	"	Denn. to Col.	100
" 23, 1910	1,993	14	47	A	7:30	5:29	..	200	17.9	22	16	100	Low.†	Col. to Denn.	100
" 24, 1910	1,020	24	2	Fast freight.	4:53	4:08	..	195	20.6	25	20	100	"	Denn to Scolly....	90
" 26, 1910	2,172	55	..	.....	1:52	1:13	..	200	18.0	8	5	100	Very little.	Alleg. to Conway..	22
" 26, 1910	2,860	45	..	.....	1:15	1:15	..	198	17.6	10	10	100	.....	Conway to Allleg..	22
" 27, 1910	2,397	44	..	.....	2:35	1:25	..	202	15.5	4	7	100	Very little.	Alleg. to Jacks R.‡	22
" 27, 1910	4,360	80	1	.....											
" 28, 1910	1,507	28	1	.....	5:18	4:38	18	187	13.2	28	30	90§	.....	Conway to Alliance	60
" 29, 1910	1,495	33	3	.....	3:45	3:33	..	197	17.2	12	19	90¶	Very little.	Alliance to Conway	60
" 30, 1910	4,080	64	2	.....	1:41	1:31	..	200	14.6	10	8	100	Low.	Scully to Conway.	24
May 4, 1910	1,515	24	..	A—35T....	6:38	4:25	..	195	18.8	21	17	100	"	Col. to Bradford..	83
" 4, 1910	1,300	27	..	Fast freight.	4:03	3:24	..	200	24.4	7	7	100	"	Bradford to Col...	83
" 6, 1910	800	22	..	Fast freight.	3:15	2:59	..	185	32.8	26	21	100	.....	Col. to Denn.‖....	100
" 7, 1910	1,264	38	..	Fast freight.	6:20	4:24	..	195	19.1	30	25	100	.....	Denn. to Scully‖..	90
" 7, 1910	830	28	..	Fast freight.											
" 9, 1910	3,965	59	..	.....	2:55	2:15	..	200	9.8	16	14	100	Low.	Scully to Conway.	24
" 10, 1910	260	6		.....											
" 10, 1910	1,110	18		.....	3:24	2:38	..	200	23.2	4	1	100	.....	Conway to Alliance	60
" 10, 1910	1,396	22		.....											
" 11, 1910	1,475	14	15	.....	7:05	4:18	12	200	14.2	20	16	100	Low.	Conway to Alliance	..
" 11, 1910	1,490	7	33	.....											
" 11, 1910	400	6	..	.....											
" 11, 1910	830	13	..	.....	4:21	3:00	..	195	20.3	16	14	100	.....	Conway to Alliance.	..
" 11, 1910	200	3	..	.....											
" 11, 1910	384	10	..	.....											
" 12, 1910	1,426	21	..	.....	4:17	3:00	..	200	20.3	10	14	100	Low.	Alliance to Conway	..
" 12, 1910	797	5	14	.....											
" 12, 1910	680	13	..	.....											
" 12, 1910	882	17	..	.....	5:00	3:55	..	200	15.6	13	18	100	"	Conway to Alliance.	..
" 12, 1910	917	4	30	.....											
" 12, 1910	825	2	30	.....											
" 13, 1910	1,501	21	..	.....	5:15	3:05	..	200	19.8	12	14	100	"	Alliance to Conway.	..
" 13, 1910	1,022	8	21	.....											
" 14, 1910	3,311	63	2	.....	1:28	1:28	..	202	13.6	7	4	100	"	Conway to Aleghny	..
" 14, 1910	3,700	59	..	.....	2:11	1:53	..	200	11.7	13	11	100	"	Scully to Conway..	..

*Fire burned in holes in forward end of firebox.
†Low, except when hooked.
‡Allegheny to Jack Run and Jacks Run to Conway.
§Flues badly honeycombed and leaked slightly.
¶Pin conveyor rigging lost out.
‖Poor coal.
° Main plunger stuck in trough. Design has been changed to prevent trouble from stoker sticking and stopping.
☆Smoked when hooking and shaking.
△More than with Pittsburgh coal.
‡Reported by train crews.
[1] Conveyor did not furnish enough coal.
[2] Fire clinkered, bad grates.
[3] Bad coal, hard running train.
[4] Fire clinkered from hooking.
[5] Tecumseh coal.
[6] Tecumseh coal, conveyor rocker arm became disconnected.
[7] Fire too light in forward end of firebox.
[8] Forward end of trough clogged with coke and ash.
[9] 100 per cent. until stoker stuck.
[10] Did not fire stoker heavy enough.
[11] Stoker engine stopped.
[12] Stoker worked too slow.
[13] Best trip to date.
[14] Coal blocked over crusher for short time.
[15] Conveyor clogged, overloaded engine.
[16] Stoker miles to date, 6,610.
[17] Except when hooking and shaking.

use in the firebox. As already stated the conveyor is worked from the upper end of the long rocker arm C, in unison with the main coal plunger. The conveyor, however, is a tender attachment, while the stoker belongs to the engine. The tailpiece or drawbar casting K of the engine is of the usual form and the trough casting of the stoker rests upon it, and is rigidly fastened so that it must follow all of the movements of the locomotive. If this is so, it follows that the conveyor must be so flexibly attached to the tender that its delivery end can follow every movement of the locomotive, and this has been done.

Although there are two stoker troughs for the delivery of the coal to the firebox, there is but one conveyor trough to carry the coal to the stoker. The trough is indicated at L on the engraving and extends from a point back of the opening M, in the floor of the tender, to the opening I, in front of the main stoker plunger, rising on a gentle incline for the whole distance. The coal is thus delivered on a double incline between the plungers, in front of which it falls for delivery into the firebox. The back end of the conveyor trough is carried by trunnions 4, which rest in bearings in the casting 5. This holds the back end and, while giving it the same vertical motion as the tender, permits the front end to move up and down with the engine and stoker, on top of which it rests at 7.

The horizontal motion is cared for by pivoting the casting 5 on the vertical pin 6, and carrying the whole load on a plate in the suitable stop lugs that are attached to the sills. The pin 6 is set but 19 in. ahead of the hole in the tender floor, while the distance out to the point of discharge is 10 ft. 1 in.; hence the lateral movement at the back end is very small.

The conveyor itself differs from others that have been used, not only in the intermittent character of its operation, but in the mechanism used for the propulsion of the coal.

The to-and-fro motion is obtained through the connection O, that runs back to the crusher P. The crusher is formed of a plunger working back and forth in a sheath that is fastened beneath the floor. The plunger traverses the opening and breaks the large lumps of coal that may be in front of it. Projecting from its upper surface are some rods 8, that are used to stir up the coal and prevent it from arching over the opening and failing to come down.

From the point 9 on the connection O, a short rod Q extends back to the lever R, which is pivoted at its lower end to the tender. From the upper end the connection S runs to the cross piece T, to which the longitudinal pieces V of the conveyor are attached. These longitudinal pieces are set one on each side of the conveyor trough, and are connected at intervals by rods 10, on which a series of fingers W are strung. These are made of 2-in. x $\frac{5}{16}$-in. iron, and there are six on each bar.

When the stoker is in motion the conveyor moves to and fro with the main plunger. As the fingers move back they rise and drag back over the coal, but on the forward movement they dig down into it and push it along. They are prevented from swinging back of their vertical position by stops. The reason for using several of these fingers in a row is to

make it possible for one to lift and slide over a large lump of coal that may be in its way, while its mates can work according to the size of the coal with which they come in contact.

It thus appears that every provision is made for taking the coal from the tender and putting it in the firebox. No attempt has been made to have the apparatus work continuously or automatically. The duty of the engine is subject to constant variation, and so must be the action of the stoker. It is started and stopped by the opening of a steam valve on the fireman's side of the cab, and can be so controlled that it will make any desired number of strokes, delivering about 28 lbs. of coal at each stroke.

The device, as constructed during the experimental stage, and in its present state of development, is fully covered by patents and pending applications in this country, as well as in Canada, England and France.

SERVICE RESULTS.

With the stoker so designed, the question is, how does it work and to what extent does it meet the requirements that have been set up for it?

In the preparation of the engine for the road the fire is built in the usual manner and the coal is put into the firebox by hand until steam is raised, so that the stoker can be worked, after which it can be made to do all of the work until the engine reaches the end of its run.

For several months the engine has been in service hauling the regular tonnage. At first it was run on the Southwest System between Columbus and Dennison, a distance of about 100 miles. At present it is working between Conway, the classification yard 23 miles west of Pittsburgh, to Crestline, on the northwest system, a distance of 165 miles. Daily reports of the performance of the engine and the stoker are made to the superintendent of motive power, showing the tonnage hauled, the time, speed, average steam pressure, the number of times the fire was hooked and shaken, the general character of the smoke emitted, and the proportion of the work done by the stoker. In this series of reports, running from January 25 to May 14, and covering 81 trips, there were but 18 on which the stoker failed to do all of the work; and of these 18, but three in which it did less than 90 per cent. of the work.

In the handling of the fire, that is to say, the hooking and shaking, there seems to be no regularity, as yet, as to the frequency of the intervals at which it is done. It is dependent upon the character of the coal, the manner in which the driver works the engine, the weight of the train, with a possible influence due to weather conditions. That the work done on the fire is insignificant is shown by two test runs that were made in which the firemen did not know that they were being observed. In one case, on a hand-fired engine, on a run of 100 miles occupying 7 hrs. and 15 min., the door was open 1 hr. and 10 min.; in the other, fired with a stoker, occupying 7 hrs. and 50 min., or 6 hrs. 39 min. of running time, the door was open 6 min. In neither case was the time that the door was held on the latch, due to an excess of steam pressure, taken into account. The difference is too significant to need comment. As for smoke prevention, it is doubtful if better results can be obtained. It is practically smokeless, in that the smoke produced is so faint and thin that the most exacting would have difficulty in finding an excuse for a complaint and under no consideration could it be called, even by the most critical, a nuisance. Under working conditions the smoke, when compared with the Ringelmann Chart, is almost clear, but with the hooking and shaking of the fire 20 per cent. of No. 1 Chart is reached, and sometimes exceeded. An average of 15 second readings during a 3-hr. 51-min. trip on the road gave a grade of .42 of the Ringelmann Chart. The greatest contrast is observed when the locomotive is being worked its hardest. As an instance of this, on a hard pull up a long, heavy grade, comparative observations were made between the stoker locomotive and a hand-fired helper of the same class, both locomotives being worked to their maximum capacity. The average of smoke readings taken every 15 seconds indicated for the stoker .39 of the No. 1 Chart, and for the hand-fired 3.84 of the No. 3 Chart. On a recent trip the engine was observed while working up the ruling grade near Sewickley. It was fully loaded and was working hard with the lever down in the corner. It was cool enough to condense the exhaust, and between the cloud of vapor so formed and the top of the stack there was a clear space through which objects could be distinctly seen. There was no discoloration except at one point where the fire was hooked, when there was a darkening, but nothing to compare with that emitted from the stacks of other engines working on the grade, and there was nothing to be seen of the sooty cloud that floats off as a locomotive passes. Riding on the engine it is possible to see the trace of a faint brown haze at all times. When the fire is hooked this darkens perceptibly, but fades within five seconds of the closing of the door. It is only when the engine is shut off and is drifting that smoke really appears. Under these conditions the smoke is black and does not differ materially from an ordinary locomotive under the same conditions.

In this respect the results differ materially from those of other stokers that have been observed. In these there was either a constant emission of black smoke, far worse than that of any ordinary locomotive, or the same emission alternating with a lightening as the plunger was drawn back and admitted air to the firebox.

Observations made on a recent trip go to confirm the reports already alluded to. With a train consisting of 18 loaded and 16 empty cars, weighing 1,484 tons, the engine worked west from Conway, holding its steam pressure constantly at 200 lbs. while taking .87 per cent. grades, one of which was nearly 9 miles long. In this the stoker did all of the work of firing. In fact, it has been learned by experience that, if the steam falls and the stoker will not bring it up, it is useless to resort to hand firing. Hand work cannot accomplish what the stoker will not do.

It seems evident from this that the stoker can be made to do all of the hard work of the fireman, but that does not mean that the man will not have to be as keenly alive as ever to his duties or that he will not have to be as busy and closely attentive. The stoker is possessed of no intelligence. It simply puts coal into the firebox in an exceedingly efficient manner. It delivers, at each stroke, about twice as much coal as would be delivered by an ordinary shovelful. Hence it cannot be worked continuously and the fireman must use the same judgment that he does now. His manipulation of the machine depends upon the work being done and what is to be done in the immediate or near future. He must anticipate grades, up or down, and be ready for them when they are reached. He will be obliged to watch his fire even more closely than at present, because of the difficulty of doing so. With the hand-fired furnace it is always possible to look in at the door and see its condition, and place the coal accordingly. With this stoker fire the coal, coming in and up from the bottom, is always intensely aglow, and it is quite impossible to see as to its condition. To assist in this a large peephole has been placed above the firedoor. By covering this with blue glass it becomes possible to make the desired observations. The fireman then will have to be fully as skilful as ever, and, freed from his heavy manual work, will have an opportunity to keep a closer watch over the combustion of the coal and produce better results than have heretofore been considered possible.

As for the economy of fuel to be effected, that is unknown as yet. That there will be some is to be expected, because of the evidently better combustion that is obtained, as shown by the absence of smoke. It is not expected that it will do better than the most skilful of firemen, but it will be better than the average, or even better than the average work of the

best man when long runs and fatigue are taken into account.

Up to the present but one engine has been equipped, and with this the experimenting has been done. The work has, however, reached such a stage in its development that the company feels warranted in extending the service. Twenty-five additional locomotives are, therefore, to be equipped with the stoker for trial service. Of these fifteen will be assigned to the lines west and ten to the lines east. Meanwhile, an engine will be put in the testing plant at Altoona for the determination of the relative fuel economy of the stoker, and the information so obtained will be published in the columns of the *Railway Age Gazette* as soon as it is in a condition to be given to the public.

BOAT AND RAIL TELPHER TRANSFER PLANT.

The Illinois Central has a large freight yard about three miles down stream from Memphis, Tenn., on the Mississippi river, adjacent to which a new telpher plant has been recently installed to lessen the cost and facilitate the transfer of commodities between boats and cars.

The terminal has greatly interested planters remote from railway facilities and convenient to the river. It has resulted in increased traffic for the railway, something that always follows improvements in terminal and transfer facilities. Such installations, which are novel in America, are more common on some of the rivers of Europe where there is close co-operation between river and rail transportation.

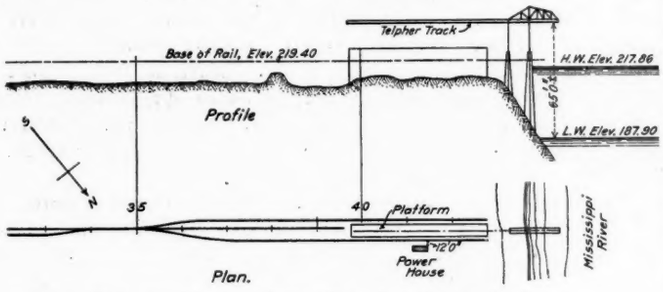


Fig. 1—Plan and Profile of Telpher System.

Fig. 1 shows in plan and profile the plant, which consists of a loading platform on shore with telpher system ending in a cantilever truss over the river. A 30-ft. barge is used at present as a loading platform under the truss, but it is expected future development in handling river traffic will permit of using the telpher to load and unload direct from boats.

Fig. 2 is a view of the plant as built, the photograph having been taken at extreme high water, a time when the bank of the river is usually submerged two to three feet. The river bank is quite abrupt and extends back practically level from the river, the land being of the character common to the Mississippi river bottoms: rich soil and alluvial silt. The terminal can be used at all stages of the river, the extreme difference between high and low water being about 30 ft. An embankment was built to a height well above high water and upon this was placed a platform 32 ft. x 300 ft. with track on each side. The wooden trestle built over the platform to carry the telpher is shown in Fig. 2. It occupies a little more than one-third the width, leaving a clear loading platform on each side. At present cotton, which is the principal commodity handled, is carried from the boat by telpher and deposited at any desired point on the platform, being rolled into the cars at the side. In Fig. 1 a track ending at the platform is shown. The intention is to extend the telpher over this track so that gondola and flat cars may be loaded and unloaded direct, thus eliminating handling on the platforms.

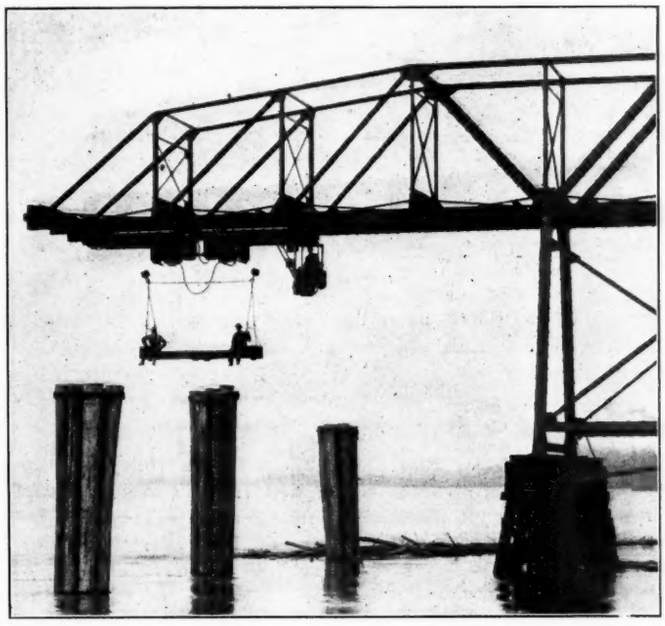


Fig. 3—Boat and Rail Telpher.

Fig. 3 shows the river end with steel cantilever truss. Since this view was taken additional cluster piles have been driven for protection. The overhang of the cantilever is 60 ft. The counterweight of concrete is connected to and forms a part of the pile capping under the steel columns. All foundations are timber piles.

Each 5-ton hoist of the carriage is equipped with a 25-h.p. electric hoist and a 10-h.p. motor for traveling. The lifting speed is 60 ft. per minute and the travel speed is 600 ft. per minute. The motors take power from an overhead trolley. The capacity is 300 bales of cotton per hour or an

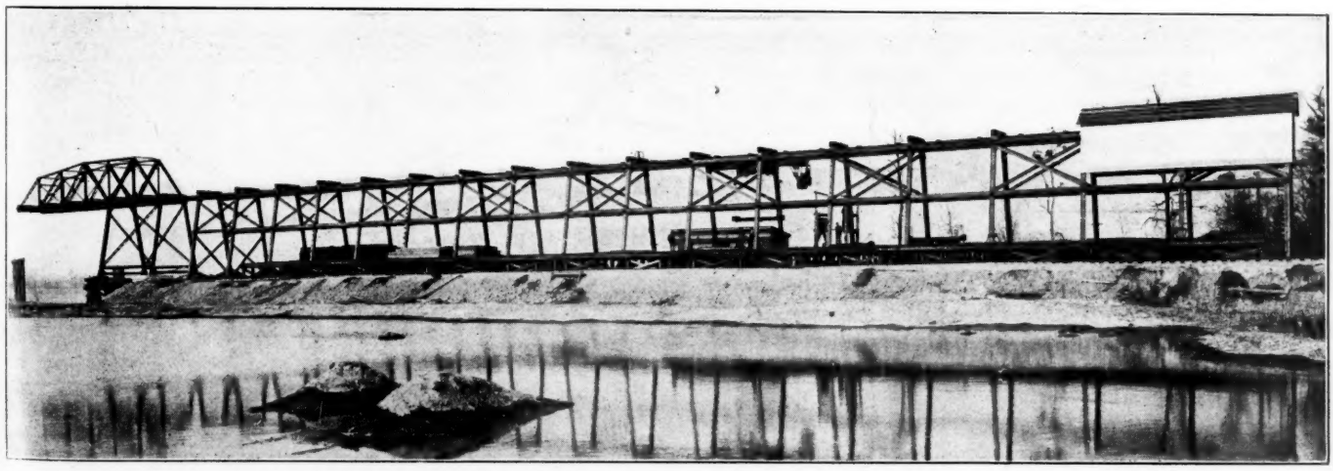


Fig. 2—Boat and Rail Telpher.

equivalent quantity of other material. A special type of low 4-wheeled truck has been built to handle the cotton and the 16-ft. spacing of the hooks will be good in the handling of lumber and logs.

The equipment consists of two 5-ton Sprague electric hoists

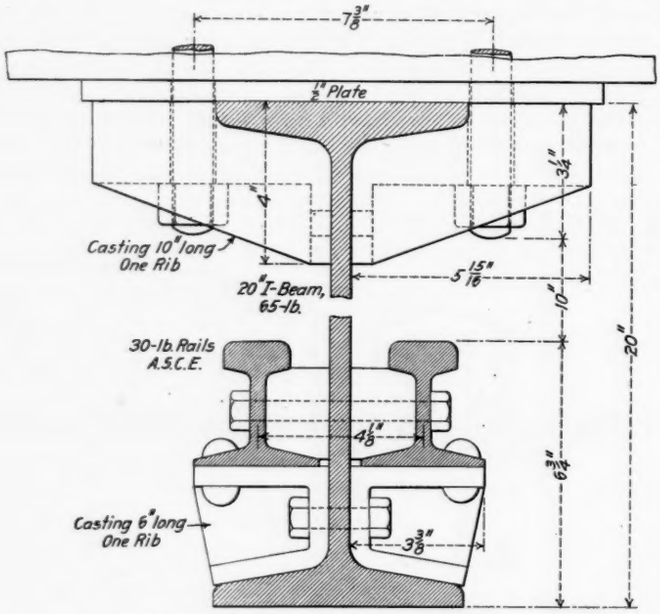


Fig. 4—Details of Telpher Track.

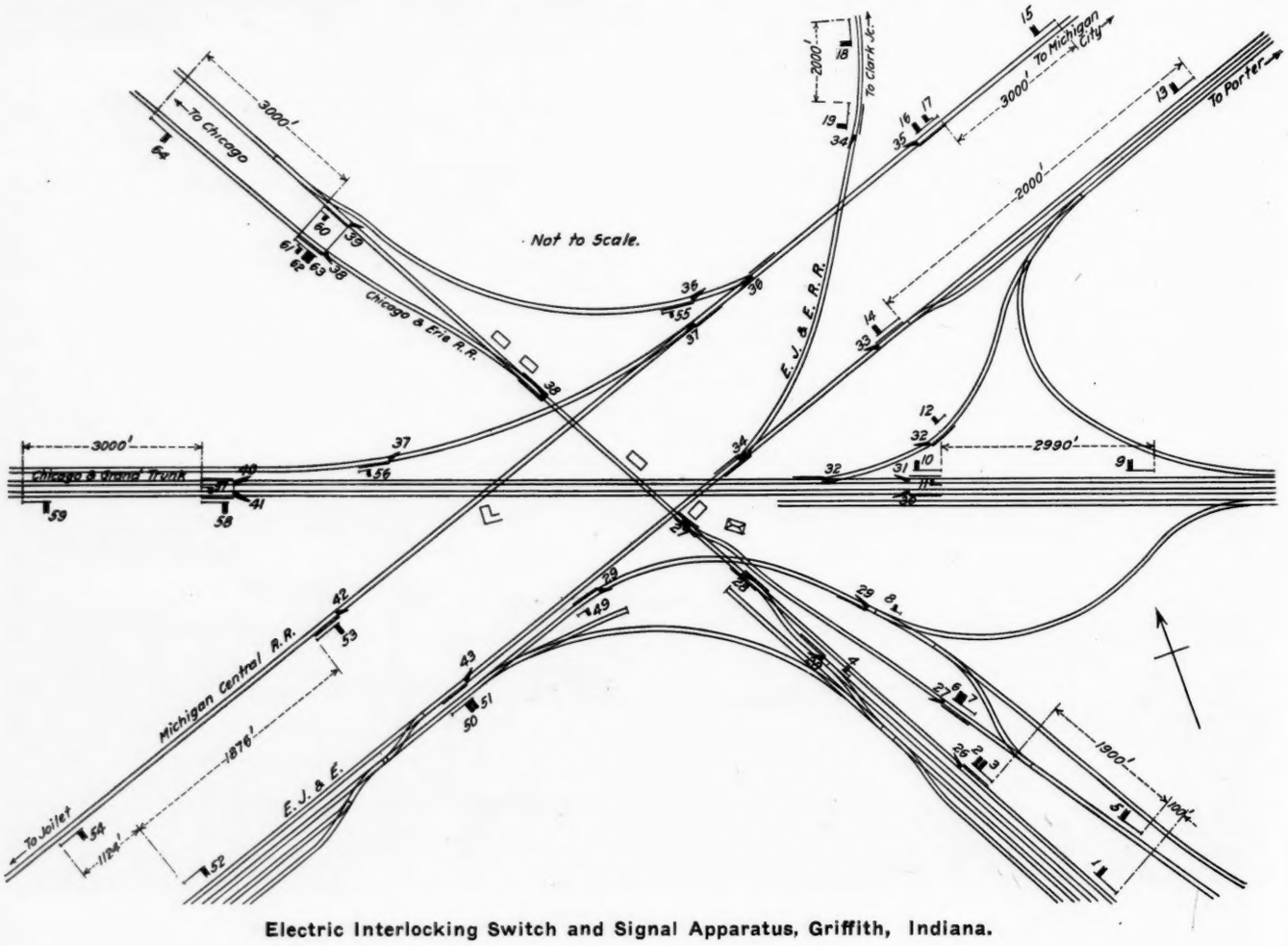
so attached together that they make a single trolley carriage controlled by one operator riding with it. The track consists of a single line of standard 20-in., 65-lb. steel I-beams, the two 4-wheeled trucks being carried on the lower flange. In this particular instance two 30-lb. rails are used, as shown in Fig. 4. The usual method is to carry the load on wheels directly on the flange and normal to the slope. The engineers of the Illinois Central say that the continued passage of a heavy machine over the flanges of the I-beams turns down the outstanding flange. In their investigation of this type of carrier they found a number of failures of track from this cause. The use of the rail is expected to guarantee perfect alinement, and, if it is ever necessary, renewal of wearing surface without disturbing the carrier. The web, by means of the special castings, will assist the flanges and eliminate failures caused by flanges bending.

To A. S. Baldwin, chief engineer of the Illinois Central, is due the credit for the idea of this terminal. The plans were prepared and work directed by R. E. Gaut, engineer of bridges and buildings, and F. L. Thompson, assistant engineer of bridges. The work was directly under the superintendence of F. O. Draper, superintendent of bridges.

GRIFFITH INTERLOCKING.

The Federal Signal Co. has just completed an electric interlocking plant at Griffith, Ind., for signaling a crossing of the Erie, the Michigan Central, the Elgin, Joliet & Eastern and the Grand Trunk. The machine has a 64-lever frame with 35 levers for 35 signals, 18 levers for 19 derails and 7 switches, and 11 spare spaces. The machine, signals and switch movement are similar in most respects to those installed on the Cleveland, Cincinnati, Chicago & St. Louis, at Indianapolis, and heretofore described in the *Railway Age Gazette* (see issues of June 18 and June 25, 1909). Since then, however, several improvements have been introduced in the machine and the circuits, and these are in use at Griffith.

The indication, instead of coming directly from the battery,



Electric Interlocking Switch and Signal Apparatus, Griffith, Indiana.

now consists of a single impulse from the secondary of an induction coil situated in the tower. There is usually only one indication coil for a plant. The primary circuit is closed at the lever when in indicating position and the impulse from the secondary goes out through a contact on the lever, over the last operating wire to the function and back through common. The indication coil is in this circuit and is so constructed as to respond only to the high voltage current generated by the induction coil. The lever indicating apparatus has been so modified as to adapt it to this change in indication circuits.

On the Erie there is electric approach and detector locking; on the other roads there is detector locking only. Electric locks are applied to the lever quadrants for this purpose. Detector bars are also provided throughout. There is an annunciator to show the approach of a train to each distant signal, 9 of them in all. The electric locking circuits are operated by a potash primary battery consisting of 40 cells, two sets of 20 in parallel. There are 9 electric locks, 15 track relays and 8 secondary relays.

The signals on the Erie work in the upper right hand quadrant. Those on the other roads work in the lower right hand quadrant. The plant was built for the Elgin, Joliet & Eastern.

WORKING OF THE EDUCATIONAL BUREAU OF THE UNION PACIFIC.

The educational bureau of information of the Union Pacific was established on September 1, 1909. Its objects, and the plans for carrying them out, were outlined in official circulars which were published by the *Railway Age Gazette* in its issues of September 3 and November 26, 1909. The actual workings of such an institution are more interesting and important, however, than its purposes and plans, because its actual workings, like its results, depend not only on the efforts and good intentions of those who establish and conduct it but also on the attitude assumed toward it by those it aims directly to benefit. The bureau has now been in existence long enough to make it practicable to tell what it is doing and how it is doing it, from which some reasonable inference may be drawn as to how much it is adapted to accomplish.

Numerous railways have adopted methods for the instruction ad training of special classes of their employees with a view of fitting them to do special kinds of work, or of fitting them to do better the special work in which they were already engaged. In many cases special instruction has been provided for mechanical apprentices. The Southern Pacific has provided a broad course of study and training to fit promising young men for officers, and its plan for this purpose has been extended to the other Harriman lines. The Union Pacific, it is believed, is the first railway to establish a bureau under the supervision and having the active cooperation of its principal offcers to try to give instruction and training to all its officers and employees, and to each according to his special needs on the particular railway and in that particular branch of the service of that railway, with which he is connected. The response to the efforts of the management to thus increase directly the efficiency of those on its pay roll and indirectly the efficiency of the operation of the road is interesting and significant. It has about 20,000 employees. Of these 1,014 had, up to about the middle of April, applied for and begun to receive from the bureau the instruction and training it was established to give. Some of these have not gone on with the work they began, but 908 were still on the rolls of the bureau. This number included 95 officials, among them being chief dispatchers, yardmasters, division foremen of engines, master mechanics and assistant superintendents. About 100 of the students are Japanese track laborers; the work of the bureau is permeating down to and influencing the efficiency of the lowest strata of employees. Since early in December the bureau has corrected over 1,500 lesson papers. In the first week in March it corrected 140; in the second week, 119; in the third week, 103, and in the fourth week, 114. The next week it corrected 125. It is now correcting an average of 125 lesson papers weekly.

What has been done, although very considerable, is no criterion of what can and probably will be done in the future, for up to the present time only a few of the instruction papers, which are in preparation, have been finished and printed, and for this reason the bureau has made almost no special effort to bring the advantages that it affords to the specific attention of the great bulk of the employees. Practically all of the applications for studentships which have been received have come in response to the initial circulars announcing the establishment of the bureau. It is believed from experience up to the present time that when all the instruction papers are finished and all employees are familarized with the scope and objects of the institution a very large proportion of the total number will without any urging enter their names on its student rolls and take the courses which are specially adapted to their requirements.

The main objects of the bureau have already been stated in the *Railway Age Gazette.* They are (1) to assist employees to assume greater responsibility; (2) to increase the knowledge and efficiency of employees, and (3) to prepare prospective employees for the service. Its use is open to all employees free of any charge. Its work is controlled by a board of supervisors, consisting of the following: A. L. Mohler, vice-president and general manager; J. A. Munroe, freight traffic manager; Charles Ware, general superintendent; R. L. Huntley, chief engineer; C. E. Fuller, superintendent motive power and machinery. Mr. Ware succeeded W. L. Park, formerly general superintendent, when Mr. Park left the Union Pacific to become vice-president and general manager of the Illinois Central. Mr. Park was one of the prime movers in establishing the bureau and took a great and active interest in it.

It is said, however, that the germ of the plan of adopting some method to educate all employees of the road was a remark by the late E. H. Harriman in criticism of the course of the management of his own and other roads in going outside of their own ranks to get men to fill vacancies. He thought the managements should work out some system of training men to fill all vacancies. The officers of the Union Pacific felt that that scheme would work best which would benefit all employees equally and would give all, as nearly as practicable, an equal change for promotion according to their abilities and irrespective of their past education, or of any support that they might receive from influential persons. They thought it would be best to try to teach every employee something without any charge and to try not so much to fit some especially to be officials as to give all a change to become officers if they took advantage of the opportunities offered them for instruction and experience.

One of the points on which they lay stress is that the bureau has absolutely nothing to do directly with operation. Its purposes are exclusively educational. It aims to fit men for promotion and its records are open to the officers to use as a guide in determining who are best equipped for promotion, but the decision who shall be promoted is absolutely in the same hands as it was before the bureau was established.

The road was fortunate in having available a man who was unusually equipped to carry out these plans. D. C. Buell, who was made chief of the bureau, graduated from Purdue University as a mechanical engineer. He was then employed on different roads for six years, being engineer of tonnage tests and inspector of transportation on the St. Louis & San Francisco for three years, and being later engaged in special work on the Minneapolis & St. Louis, the Minneapolis, St. Paul & Sault Ste. Marie, the Burlington and the Denver & Rio Grande. He was doing fuel work on the Union Pacific when the educational bureau of information was established. G. W.

Siever, assistant chief of the bureau, had been equipped for this work by 25 years experience on the Union Pacific as accountant, station agent and office man.

The correspondence school plan was adopted because it was believed it was best adapted to meet the peculiar requirements of the situation. The correspondence course being used is better for men on the Union Pacific than any general correspondence course could be, because it deals, not with railway work generally, but with work on the Union Pacific specifically and is as to that road official.

An advisory board acts with the chief of the bureau in carrying on its work. It is composed of H. J. Stirling, auditor; J. Sundland, the chief engineer's office engineer; A. H. Fetters, mechanical engineer; J. C. Young, signal engineer; C. J. Lane, first assistant general freight agent, and John A. Sheean, assistant general attorney for Nebraska. The operating member of the board formerly was T. J. Foley, formerly assistant superintendent but now assistant general manager of the Illinois Central. No successor to Mr. Foley on the board had been named at the time this article was written. This board is composed, as will be noted, of an expert from each of the departments. It plans the various courses of reading and study, passes on applications for courses and assigns the work to be done by each student, determines whether questions asked by employees and officers shall be answered, and passes on the answers prepared, etc. It also advises the chief of the bureau on such matters as he brings up and outlines the policy to be pursued in handling new matters suggested by his work. It meets every Monday evening at 7.30 o'clock, and its sessions are usually attended by some of the general officers. If some special matter of a good deal of importance is to be considered or acted on, other officers are asked to attend. For example, on one evening when the course for the preparation and training of station helpers was under consideration, an assistant superintendent from each of the five divisions of the road was called in to advise.

Perhaps at first some of the members of the advisory board were disposed not to take its work seriously. They are now all deeply interested and deeply serious. The bureau imparts information in two ways. (1) It answers specific questions sent in to it by officers and employees, and (2) it gives those who desire them courses of study adapted to their special needs.

Each question asking for specific information is carefully scrutinized by the chief of the bureau and the advisory board to find out if the person asking it has any motive other than that of securing helpful information. The reason for this is that there is always danger that somebody may try to get a ruling on some point relating to discipline which, if made, might prove awkward both for the questioner's superior officer and for the bureau; and therefore questions which might relate to discipline, however indirectly, are not answered. If the question is considered a proper one it is referred to that officer whose special line of work makes him most competent to answer it, and his answer is sent to the advisory board and by it to the employee. The answer to such a question becomes official information and subsequently will always be made by the bureau in response to the same question.

It was thought that the answering of questions in this way would be one of the most important functions of the bureau. The number of questions received, however, has not been so large as was anticipated. Up to the time material for this article was obtained 140 questions asked by 47 men had been answered. The fact that each man who asked any questions at all had asked an average of three shows that when one has once asked and got a satisfactory answer he is encouraged to ask more. Probably the main reason why only a comparatively few requests for specific information have been received is that employees and subordinate officials dislike to disclose their ignorance in regard to matters which perhaps it may be thought they should know. As a matter of fact, however, the person who answers a question usually does not know who asked it, and it is expected that when this, and the fact that the management very much desire employees and officers to make use of the bureau to secure prompt and accurate information become known, the number of questions received and the number from whom they come will largely increase.

All employees who take a course of study are required to begin by reading a paper prepared by the bureau entitled "How to Study," and next to familiarize themselves with the history and geography of the Union Pacific. "History of the Union Pacific" was prepared by C. J. Lane, first assistant general freight agent. Its purpose was stated to be "to review the history of the Union Pacific, and with such brevity as will bring the story safely within the inceptor's evening hour of study." It would be an indifferent writer indeed who could not make a history of the Union Pacific interesting. Mr. Lane proved not to be an indifferent writer, and produced a paper which is fascinating to one not connected with the road and must be more fascinating to those who are. It contains only 59 good sized type-written pages.

The papers next prepared deal with the geography of the road. It operates in five states, Nebraska, Wyoming, Colorado, Utah and Kansas. The student is required to first read a general geography of the road and then to study that paper relating specifically to its geography in the state in which he works. The advantages of having officers and employees familiar with the geography of a road are numerous. For example, the home seeker on a passenger train is pretty apt to question the conductor about the nature and resources of the territory which the road serves, and intelligent answers may be the means of getting him to settle in its territory and become one of those who furnish it traffic. It has been the aim to write the papers on geography so as to make them no less interesting than instructive, and the story is told of a conductor who was formerly employed on the Nebraska division, but who is now on the Wyoming division, who while laying over began at 7.30 p.m. to read the geography of the road in Nebraska and never quit until 11 p.m., when he finished it.

The student having finished the prescribed papers on history and geography is started on a study of those things a knowledge of which will directly increase his efficiency as an employee—mechanical engineering, section work, transportation, traffic, maintenance of way, civil engineering, station work, air-brake operation, locomotive firing, locomotive running, or what not. The way that the papers dealing with the different special subjects have been and are being prepared is novel and interesting. Take, for example, the paper on "Track." That part of it which deals especially with maintenance was assigned to the assistant division engineer, who was considered the best expert on the road on the maintaining of track; that part of it dealing with tunnels was assigned to the man who handles tunnel matters, and likewise such matters as the construction of double track, new construction, rails and fittings, etc., were assigned to experts on these various subjects. Each man's paper was read and approved by his immediate superior, and then the various writers were called into the bureau to confer. Each read his paper aloud and the others criticised questionable statements, suggested things that had been left out, etc. When differences of opinion arose, the matter involved was submitted to vote and the majority ruled. After this the papers were taken away by their writers for revision and correction. When they were returned to the bureau they were submitted to the chief engineer to be edited and approved by him, and finally they were illustrated and published by the bureau.

In a similar way the course in station work was prepared by the agents at a number of important stations who held a three days' conference at Omaha to correct, revise and pass on what had been prepared. In like manner the courses for

locomotive firemen and enginemen were prepared by the road foremen of engines and revised and approved by the master mechanics and superintendent of motive power. A paper on combustion was written by Mr. Buell, the chief of the bureau, read by him to the road foremen and approved by them and subsequently passed on by the engineer of tests, the mechanical engineer and superintendent of motive power. A pamphlet describing the construction and operation of the first Mallet articulated compound locomotives bought by the Union Pacific was published, placed in the hands of the enginemen and studied by them before these engines ever reached the tracks of the road. A splendid pamphlet on "Courtesy" was printed and circulated among all employees with the object of improving the treatment given to the public. A paper on track tools containing illustrations of all the tools used, and the correct method of using them has been printed in both English and Japanese, the Japanese on each page being a literal translation of the English on the facing page. In addition, the Japanese track laborers have been furnished with grammars and dictionaries so that they can use this paper in learning the English language. For the first time the management of the road knows that its Japanese employees understand the rules applicable to them and their work.

The chief of the bureau and the advisory board exercise a good deal of care in selecting the course of study which an employee shall be given. A chief clerk to an engineer who was engaged on construction was provided with a course in Maintenance of Way Accounting. An assistant division engineer who wanted to better qualify himself for his present position is being given enough algebra, geometry and trigonmetry to equip him to go further in the study of railway civil engineering. A fireman is given only a locomotive engineer's course until he has passed his examination for promotion to engineer. After he has passed his promotional examination he is given a course that will better enable him to perform his duties as an engineer. An employee is not allowed to take a course of study relating to matters outside of his department without the authority of the general superintendent. When, however, there is good reason for it, an officer or employee may be allowed to carry two or three courses.

When it is decided that a man is good material for promotion a plan is worked out in some cases for preparing him for advancement. For example, a trainmaster on the Utah division was taken from the service and assigned to student work at the same rate of pay and expenses allowed him in regular service. He worked three months in charge of an extra section gang. He was then given three months experience in repairing and caring for locomotives in a locomotive shop. At the time material for this article was secured he was filling a temporary vacancy in the operating department. It was intended that when he was relieved he should be given two months' experience in the accounting department where he would come in direct touch with the incorrect reports often made by freight and passenger conductors and station agents. It was intended after that to have him go through the company's station agent school and then serve a short period of apprenticeship in the store department and in the general offices, including those of the traffic department. It was thought that at the end of this time he would be qualified to be promoted to assistant superintendent when a vacancy took place. The bureau, of course, had nothing to do with transferring him from one place to another. This was handled by the operating department. What the bureau did was to aid him to get a knowledge that would fit him for his prospective duties.

In many cases the names of students who are making good progress are brought to the attention of the officials interested for their information. Once having given the officials this information the duty and authority of the bureau have been exhausted.

This, like all other correspondence schools, has to have a good "follow-up" system to get some of its students to keep up their studies. In the first place, of course, the student is required to answer a list of questions relating to the subject dealt with in his instruction paper before another instruction paper will be sent to him. The questions are framed with the design of causing the student to do a maximum amount of study and a minimum amount of writing. Failure to deserve a grade of 75 per cent. or more may result in his being asked to study the lesson and answer the questions again. If the questions relating to a lesson are not answered within 60 days he is sent a form letter calling his attention to the fact and urging him to answer the questions and go on with the course. If no reply to this is received within 15 days, Mr. Buell writes him a personal letter, and if this does not bring a reply he is dropped from the student rolls.

When an employee desires instruction in regard to some matter a course in which would not be suitable to any considerable number of employees, a special course is devised for him. One of the interesting features of the work of the bureau is that all of its instruction papers are reviewed by the road's law department before they are sent out to students to see that they contain nothing that the law department cannot back up.

As before stated, one of the purposes of the bureau is to "prepare prospective employees for the service." The most important work it is doing in carrying out this purpose, is to conduct a school for station helpers at its headquarters in Omaha. This school is in direct charge of an employee of the road who has had 25 years' experience in station work on the Union Pacific. Students must be at least 18 and not more than 30 years of age. Practically all of them are boys and young men who have received enough instruction at telegraph schools along the road to send 20 words a minute. They are allowed three hours daily for practicing telegraphy and given five hours' station work. A practice circuit has been established in the school room, and an arrangement has been made so that the students can cut in on the road's telegraph lines. All the forms used in regular railway station work are provided and are used by the students precisely the same as they are in regular station work. The room is open at night and there is seldom an evening when some of the boys are not in it practicing with the key. Before a boy is allowed to begin taking the course he must pass a severe physical examination and he must pay his own expenses while in Omaha taking the course, and pay for his transportation to that city. He is usually kept in the school three or four weeks. Formerly the station agents on the Union Pacific protested against being required to take student station helpers, but the training being given in the bureau's school is so effective that most of the station helpers it turns out do good work from the start, and now the station agents instead of objecting to taking them are asking for them. They must serve at least three months as station helpers for $25 to $35 a month before they are considered for promotion to a telegraph position. Frequently talks are made to the boys by officers of the company, Mr. Mohler, Mr. Stirling and Mr. Lane and others having addressed them at different times. The school now has 20 students. Up to the time material for this article was obtained, 68 graduates of it had been furnished as station helpers, and of these 24 have been promoted to operators.

In the line of fitting prospective employees for the company's service, the educational bureau also makes investigations regarding those not already in the company's service who apply for positions. Up to the middle of April it had investigated 388 applicants, and in the quarter from January 1 to March 31 it investigated 253. Of those investigated it recommended the employment of about one-fourth, and of these about one-half had been given positions. Special consideration is given to the applications of relatives of present employees. The bureau also keeps in touch with the universi-

ties, colleges, high schools and technical schools for the purpose of having at all times material on hand desired by the various departments of the road. Generally speaking, it is not its aim to get applications or to help qualify men for advanced positions, although it is glad to have on file the names and qualifications of men fit for such positions. No person will be put on this available list without having passed a severe medical examination. The record of each applicant's physical test and his general personal history are kept in the "positions material file." An applicant who has had no railway experience and who has relatives in the service is given any course of study he wants.

The majority of applications for positions are referred to the bureau of investigation, although there is no rule requiring this. The principle according to which the operating department co-operates with the bureau was well stated in one of the circulars regarding the bureau, which was issued last August. "Persons registering with the bureau may indicate the particular line of work they desire to follow. They will be given every opportunity for learning the elementary methods and requirements of the department they wish to enter, and while it is not promised that positions will be given to all applicants, it is, however, expected that the various departments will avail themselves of this opportunity for filling vacancies in their ranks by individuals registered with this bureau who have taken advantage of the opportunity to qualify themselves for the positions desired."

The work that the educational bureau of the Union Pacific is doing seems admirably adapted to secure some very important ends. It seems adapted to increase the loyalty of employees who, it would seem, can hardly fail keenly to appreciate the efforts and expenditures the company is making for their improvement. It seems adapted to increase the efficiency of employees and thereby to increase and improve the services rendered by them to the company. And as many of the instruction papers directly or indirectly suggest to employees how they may treat patrons of the road better and why in their own interest and that of the road they should do so, the bureau seems well adapted to promote better treatment of the public and thereby to foster more satisfactory relations between the public and the road.

THE PRINCIPLES GOVERNING THE ARRANGEMENT OF AUTOMATIC BLOCK SIGNALS.

BY W. H. ARKENBURGH.

The art of signaing a railway is the art of so arranging signals that train movements will be expedited and the capacity of the road thereby increased to the maximum consistent with safety and the demands of traffic. This involves providing such indications or aspects, and so placing the signals, that an engineman will be at all times informed of the condition of the track a sufficient distance ahead of his train to enable him to stop short of any obstruction against which it is possible for a signal to give warning. Therefore, the problem of signaling a road is an operating problem.

While a train is moving there are only three things which a block signal need tell an engineman in order that he may properly control his train; they are: 1, "It is safe to proceed"; 2, "Prepare to stop (apply brakes)"; 3, "Stop." It is time enough to tell an engineman why he has been stopped and what to do next, after he has brought his train to a stand. Therefore, those signal aspects which tell an engineman what to do after he has stopped, have no place in this discussion, as they do not affect the capacity of the road.

The location of, or more properly, the position occupied by, the block signals with respect to each other and to the various physical characteristics of the road is the factor in signaling most vitally affecting the operation of trains. Those physical characteristics of a road which it is necessary to consider in placing block signals may be divided into two groups, primary and secondary. Primary physical characteristics are: (a) grade, (b) curvature, (c) view, (d) switches, (e) stations and yards, (f) interlocking plants, (g) tunnels. These should be considered purely from an operating standpoint. Secondary physical characteristics are: (h) kind of ballast, (k) cuts, fills and the nature of the subgrade and soil, (l) bridges, (m) parallel tracks, (n) highway crossing bells. These introduce engineering problems. How the various physical characteristics influence signal location may be briefly stated as follows: (a) Signals must not be placed on heavy grades, where, if a train should be stopped, it could not start again or could start only with extreme difficulty; this would cause serious delay and often injury to draft rigging. (b) Signals must not be placed on sharp curves, as these have the same effect as adverse grades; they offer resistance to train movement. (c) Signals must not be placed where the view from an approaching train is obscured by curves, buildings, overhead structure, trees or other objects. An engineman needs time in which to read the signal indication so as to be able to act upon it. Therefore he must have an unobstructed view of a signal for a greater distance than that through which his train will run in the time necessary to read the signal indication. (d) Signals should be so placed with reference to a switch that a train may be stopped as near as possible to the switch, should it be necessary or desirable to stop before passing it. Thus trains may "close up" and avoid proceeding slowly for a long distance into an unoccupied block. (e) Signals should be so placed at stations that a train occupying the station block will not unduly delay a following train (compare d), but will permit it to approach as near as may be to the station before stopping. This involves also the provision of a short station block with a starting or advance signal; this to be near the fouling point of the outgoing passing track switch, if there be one. This will not only permit a train to approach close to the switch when in use (see d), but also will allow a train to clear the station block in good season to admit a following train. It is evident that the entering signal of a station block should be so placed as to be beyond the rear end of any train that might stop at the station, otherwise a following train would be held one block farther back and thereby delayed. Likewise it is expedient to place the signal in the rear of the entering signal as short a distance back as safety will permit for the same reason, as well as to prevent serious delays due to switching on the main line beyond the entering switch. (f) Interlocking plants affect signal locations much as do switches and stations in that a short approach block should be provided, both to expedite closely following trains and to give a distant indication for the interlocking home signal not too far beyond the braking distance; also an advance signal should be provided as close in as possible, in order to allow a train to clear the plant quickly and release the route for a following train. This advance signal can be much closer than would an ordinary block signal on the open road as the distant indication for the home signal can be made to repeat for it also. (g) Each tunnel should constitute one absolute block with the entering signal as near as may be to the portal. A tunnel block should not be divided for the reason that a train should not be admitted unless the track is clear for it to pass all the way through. A train should never be stopped in a tunnel because of the effects of darkness and foul gases on the persons (employees and passengers) concerned. For this reason the outgoing signal should be placed at a distance equal to the maximum train length from the outgoing portal. (h) The nature of the ballast limits the practicable length of track circuits. Therefore, where the ballast is of itself or owing to local conditions a good conductor of electricity, track circuits must be made comparatively short. This may make it expedient to shorten a block somewhat rather than go to the expense of providing an additional track circuit. (k) Cuts and fills may influence signal locations as they obstruct or improve the view or as they make difficult and expensive the construction

of signal foundations at a point which would otherwise be the logical place for a signal. The nature of the subsoil must be considered for the same reason, viz., it is more expensive to build foundations in rock, quicksand, etc., than in loam. (l) Bridges affect signal locations in the same manner as cuts and fills; moreover, it is inexpedient to stop a train on a bridge because of the possible danger to persons stepping off the train. (m) Parallel tracks, owing to the expense of spreading them so as to provide clearance for a signal, and if this cannot be done, the cost of a bracket post or bridge, may influence signal locations. It may be better to place a signal so as to avoid the additional cost, even though the location chosen may not be all that could be desired otherwise. (n) It may be expedient from the standpoint of economy, so to place a signal with relation to a highway crossing bell, that an additional track circuit will not be required. Also, when possible, signals should be so placed that trains stopped by them will not cause the bell to ring all the time they are standing, as this is a source of annoyance to the public as well as a drain on the battery.

The principles here set forth cannot be applied equally well in practice to double and single track signaling. On the double track the choice of a signal location is not nearly so restricted as on single track. Each track of a double track is usually signaled for movements in one direction only, therefore the effect of a signal in a certain location need be considered only in relation to trains moving in the established direction. This is not the case on single track, for there the effects of overlaps and the relations of opposing signals must be considered. On double track the signals may be placed in general where most expedient from an engineering standpoint, as usually, 500 ft. one way or the other will not materially affect the operation of trains. Therefore if by placing a signal some distance from the position it would normally occupy, considering operation alone, and if safety is not sacrificed, an appreciable amount of money can be saved, it is expedient to do so.

So much for the physical characteristics of a road and their relation to signal locations. It is necessary now to consider the relation of the signals to each other.

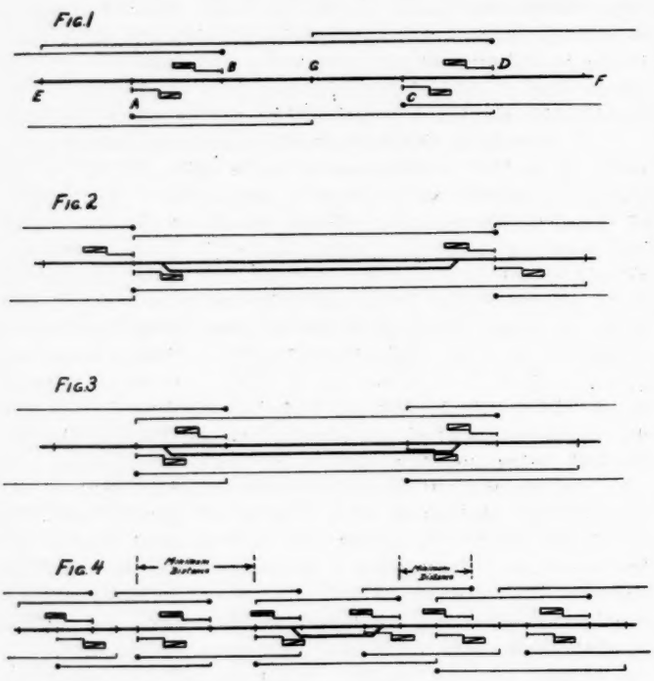
With any arrangement of signals trains running at full speed will be spaced a distance apart (measuring from engine to engine) equal to the length of the block plus the distance from the approach indication (distant signal) to the home signal (usually one block) plus the distance the train will run while a signal arm is moving from the stop to the proceed position, plus the length of the preceding train. Therefore to accommodate maximum traffic of any one class, signals should be so spaced that the length of a block (B) that is, the distance between home signals is equal to Br + T + X. Here Br is the braking distance for a train, T is the distance the train will run at full speed while the engineman is acting on the signal indication, X is a certain factor of safety. The warning, or approach indication, to be discussed later, should be given when possible at the same point as the home or stop indication. With this arrangement trains are able to follow each other at full speed two blocks apart with perfect safety, for should the first train stop, the following one would receive warning in time to stop at the entrance to the occupied block. Such an arrangement will accommodate a maximum number of trains of a given class, for it will permit trains to follow one another as closely as it is safe to follow. The part played by the various factors of the formula for the length of block is as follows: Br; it must be possible to stop a train running at full speed between the warning and stop signals in order that it may not over-run the stop signal and collide with a train that may be standing just beyond. T; should an engineman fail to see a signal until just before passing it, he might not be able to stop, if required to do so, were the distance his train will run while he is acting on the signal indication not added to the length of the block. The length of the train will affect the number of trains that can be run, for a signal will not commence to clear till after the last car of a train has passed it. Likewise the time required for a signal arm to move from the stop to the proceed position will affect the number of trains it is possible to run. The factor of safety needs no explanation. It should not, however, ordinarily be less than 20 per cent. In determining the braking distance for a train the grade of the track and any other conditions constantly affecting the speed of the train should be considered separately for each block. Of course, in practice, it is not possible to apply rigidly the principles above set forth. The physical characteristics of the road as before explained would greatly modify them even if it were always economically desirable to provide for the greatest possible number of trains on any given section of road. Moreover no account has been taken of the overlap as applied to single track signaling. Other factors also enter into the problem. There are always several classes of traffic to be considered, slow and fast trains; trains of different lengths, and yards and terminals through which speed is limited. Considering these the blocks may be considerably shortened, and should be, so that trains may close up. In presenting the formula for maximum traffic, it was given as applied to one class of trains only; that is to say, maximum number of trains of a given speed. The subject of signaling for trains of different speeds on the same track has been discussed previously. Suffice it to say here that signals spaced for trains of one particular speed, say fast express, are not suited to slower trains, such as heavy freight and vice versa, where such trains must follow each other closely; for a slow train will not be able to clear a long block fast enough to leave a proceed signal for a following train, which will thereby be delayed; and short blocks suited to slow trains are apt to be of less length than the braking distance for fast trains and consequently dangerous.

On single track when signals are used to afford head as well as following protection, some amount of capacity must be sacrificed; this for the reason that overlaps must be used. It is customary to place signals between stations governing in opposite directions, toward each other, a certain distance apart, usually not less than 1,500 feet, so that there will always be that much space between two opposing trains which may be stopped by such signals. This is called "staggering." Theoretically it is not necessary, as every train is supposed to stop at an adverse home signal. Theoretically, also, there should be no maximum limit, but it sometimes happens that two trains are so stopped in spite of train orders and therefore it is expedient to reduce as much as possible the distance that a flagman must walk or ride a velocipede. Now, considering two sets of staggered signals, in order that where two trains are approaching each from opposite directions each shall have a stop signal between it and the other train, it is necessary to provide an overlap; in other words, the home indication must govern beyond the next signal in advance. Calling the four signals respectively A, B, C and D, Fig. 1, A must govern to D and D to a point beyond A. It is not necessary for each to overlap the other; the long overlap can be at either end. Now a train approaching A will set B and D at stop, while a train from the opposite direction will set C at stop. Therefore the two trains will be stopped at C and D, respectively. This rule applies to any number of sets, as each group of four consecutive signals should be considered a unit so far as overlaps are concerned.

It is usual to provide a cut section at some point on each side of each pair of staggered signals, at which the overlap can end, as E, F, G, Fig. 1, thus reducing the length of the overlap and proportionately increasing the capacity of the road if the distance between pairs is great. This cut section, however, should not usually be less than 1,500 feet from the nearest signal, for reasons that are obvious when fast trains are considered.

The proper arrangement of signals at stations on single track presents some difficulties, but in general the principles outlined for double track apply. If signals are placed op-

posite (directly across the track from each other) Fig. 2, beyond the outer switches, no protection is afforded to a switching train against a train about to leave the station. If signals are staggered, the entering signals beyond the switches and outgoing signals at the fouling points, Fig. 3, it is impossible to use the main track beyond the outgoing signals without the liability of seriously delaying incoming trains. However, the amount of protection afforded by this arrangement would seem to warrant its use. To minimize delays as much as possible it is best that the first set of staggered signals beyond the station be placed the minimum distance as calculated from the formula for maximum traffic given above. The space between this set and the next can be as great as desired. With such an arrangement, Fig. 4,



trains can do switching on the main track a much greater time than if the intermediate sets of signals were spaced at equal intervals.

The foregoing illustrations show the most economical method of overlapping signals at stations. It will be observed that only one entering signal overlaps beyond the station. This overlap should be in the direction opposite to that of superior trains; in other words, if westbound trains are superior the overlap should extend to the east. With this arrangement if two trains of the same class are to meet, the inferior train will have to stop at or near the entering signal in any event in order to open the passing track switch to take the siding, therefore it will not be delayed by the stop signal set by the superior train, and the superior train will not receive a stop signal until it reaches the outgoing signal, if the inferior train comes in with but little time to spare. Thus movements are facilitated to the greatest degree possible. Heretofore it has been usual to overlap both entering signals beyond the station, but this is not necessary for safe operation, and it will cause delays that would not occur under the arrangement outlined. By placing the signals as shown in Fig. 4, and arranging the overlaps accordingly, the greatest facility is provided for switching movements. And the signals are closely spaced at stations, thus allowing trains to close up for following movements where it is most desirable to do so. At some excessively long yards it is necessary to place intermediate signals between outgoing signals. When this is the case they can usually be treated in the same manner as staggered signals between stations.

In order that an engineman may properly control his train, it is necessary to provide not only a stop indication, but also a caution, or perhaps more properly, an approach indication. That is to say, an engineman should be told at some point whether he is approaching a stop or a proceed signal. Without this information he might not see a stop signal in time to bring his train to a stand before reaching it. This indication is usually given at the entrance of the block in the rear, thereby combining two signals in one for purposes of economy in the matter of posts, battery, battery housing and other accessories. Where two-position signals are in use and the approach indication is given by an arm of distinctive shape and a separate light (of distinctive color), it has been the practice on many roads to erect a separate distant signal within the block at a distance from the home signal equal that given for maximum traffic. This practice is the only correct one to follow where home signals are placed, as they often must be on roads of thin traffic, a distance apart much greater than the braking distance for fast trains. It is usually poor policy in such cases to combine the indications on one post, as the approach indication then ceases to be of practical value owing to the fact that it is not given at the point where the engineman must begin to act upon it (apply brakes). This renders it an absurdity, for an engineman will be obliged to learn the length and characteristics of every individual block so that he may know at what point, after having passed an adverse distant indication, to begin to stop. This, if practicable at all, would put too great a strain on the man's memory and enhance the risks due to the human equation. It would seem better to abolish the indication altogether, trusting to an engineman's knowledge of the road to pick up his home signal indication in time to stop, and as an aid, to so place the signals that a good view of each could be obtained for a sufficient distance. Special intermediate distant signals could be used at points where a good view could not be had. By doing this a considerable amount of money could be saved on many installations. It is perfectly feasible to provide separate approach indications with a three-position signal system. The home signal can be made to work between 0° and 90° and a three-position signal governing to the end of the block and repeating for the signal in advance erected at the proper point to give a correct approach indication. The only factor to be considered in such a system is that of cost, which would be high. The manifest advantages of telling an engineman exactly where to begin to apply brakes, are not, however, to be underestimated. Nervous strain on enginemen, wear on brake and draft rigging and consumption of fuel due to needless stops and slowing up of trains, and sudden stopping at a stop signal whose approach indication is absent or has been forgotten, should be taken into account.

On single track the distant indication is of little or no value for opposing movements between stations for obvious reasons; nevertheless it is extremely useful for following movements and it can be made very useful for giving information to enginemen approaching stations. Here the distant indication for the entering signal should serve also for the next signal in advance. When this is done with the arrangement of signals which I have described neither of two trains approaching a station from opposite directions will receive a full clear signal at the last intermediate signal and then receive a stop signal at the entrance to the station, as can otherwise happen. If a separate distant signal is provided, it should be arranged with track circuit control to a point sufficiently far from the opposite end of the station to accomplish the same result.

Wherever signals are closer together than provided for by the formula for maximum traffic, the distant indication for the first signal should also govern the approach to the second, otherwise an engineman will not have time to stop at the second signal should it be against him. In such a case, the second signal should also have a separate distant indication at the first, so that an engineman will not resume speed at the first signal, finding it clear, only to meet a stop signal a short distance beyond. Interlocking plants are points where this situation is most often met.

General News Section.

The New York, New Haven & Hartford has increased by 8 per cent. the pay of 5,000 employees in its shops.

The New York State Civil Service Commission announces examinations June 25 of candidates for various positions, including civil engineer, for the Public Service Commission, second district, on grade crossing work; salary, $2,000 to $2,400.

The question of the wages of the employees of the Connecticut company (operating the street railways in Connecticut owned or controlled by the New York, New Haven & Hartford) is to be left to arbitration, the board consisting of one man chosen by the company, one by the employees and the third by these two arbitrators. Clarence Deming, associate editor of the *Railway Age Gazette*, has been named by the company; the employees have not yet made a choice.

An officer of the Northern Pacific writes that this road now supplies nearly all of its dining cars running out of Seattle with milk and eggs from cows and chickens on poultry and dairy farms owned and operated by the company, and that it is just starting a truck garden at Paradise, Mont. All of these enterprises are in more or less of an experimental stage, and the company has not as yet arrived at a conclusion of the desirability of extending its experiments. It has not yet decided whether it can produce better supplies for its dining cars itself than it can procure from outside sources.

Trains entering and leaving the Grand Central Station, New York City, now use the new platform-tracks exclusively, the last two tracks on the old level having been abandoned on Sunday last. On the upper level of the new part of the station—which is at the east side and 15 or 20 ft. below the level of the tracks in the old station—24 tracks are now in use, and on the level below this, used at present wholly for suburban trains of the New Haven road, six or eight tracks are in use, though more than twice this number are finished. The arrangement of nearly all of these tracks on the upper level and all on the lower level is temporary. When the whole of the new tracks are finished the principal platforms will be nearer the center of the yard, and the tracks now in use will be spare or will be used for storage. The excavation for the new station and tracks, largely hard rock, is now considerably more than half done.

Railway Matters in Washington.

Washington, June 8, 1910.

The administration bill was passed by the Senate on Friday last, at 10 o'clock in the evening, after a discussion extending over 12 weeks. The vote was 50 to 12, the minority being all Democrats.

The final action in the Senate was to take up the House bill and, after striking out the whole of the substance of that bill, putting the Senate bill, which had been framed in committee of the whole, in place of the House bill; that is to say, the Senate bill under the House title. The principal features of the bill as it now goes back to the House are:

1. Provision for a court of commerce to consider appeals from decisions of the Interstate Commerce Commission.
2. Amendment of the long and short haul provision of the present law so as to allow a greater charge for the short haul only with the consent of the commission; and forbidding the fixing of a lower rate for the purpose of destroying water competition.
3. Rates to be furnished in writing on application of a shipper; penalty for error, $250.
4. Authority given the commission to investigate the propriety of any new rate.
5. Shippers given the right to designate a through route or part of a route.
6. Telegraph and telephone companies subjected to jurisdiction of the commission.
7. The government, rather than the commission, is made defendant in all cases coming before the court, but the commission and other interested parties are allowed to intervene.
8. Federal courts are forbidden to suspend the operation of state laws except when the matter is presented to a justice of the Supreme Court or a circuit judge and is heard by three judges, one of whom shall be a Supreme Court judge or a Circuit Court judge.

It will be seen that from the bill as it stood three months ago the following features have been cut out: (a) the provision to permit traffic agreements contrary to the anti-trust law; (b) the provision to permit one road owning 51 per cent. of another to buy the remaining 49 per cent., and (c) the requirement that stock and bond issues shall be subject to federal regulation.

Yesterday (Tuesday) the House, after a long debate, voted down a proposition, strenuously urged by the insurgents, to accept the Senate bill as it stands, the insurgents and most of the Democrats believing that in a conference between committees of the two Houses the conservatives would secure the most important advantages. The "regulars" won this vote by a narrow margin—162 to 156. Now the bill will go to conference. The conferees on the part of the House are Messrs. Mann, Wanger and Adamson, and those on the part of the Senate are Messrs. Elkins, Aldrich and Foster. Mr. Mann, in arguing for reference of the bill to a conference, declared that the Senate had been careless in many of its amendments. One of the provisions inserted in the Senate allows consignees who have suffered by the incorrect quotation of a rate to recover damages, which would open an easy way of granting rebates. The Senate had cut out the clause giving the Interstate Commerce Commission authority to regulate charges; had refused to give interurban roads the privilege of having through rates over standard railways, and had made a mistake in adding the clause to put telegraph and telephone companies under the authority of the Interstate Commerce Commission. In the conference the representatives of the lower House will probably try to have retained the clause providing for physical valuation of railways.

The bill, as it left the Senate, was to go into effect 60 days after approval by the President, but the President has this week sent a special message to Congress recommending that the clause empowering the commission to suspend tariffs announcing increases of rates shall go into effect at once.

On Monday Messrs. Ripley, of the Atchison; Delano, of the Wabash, and Felton, of the Chicago Great Western, came to Washington and conferred with President Taft about the injunction suit brought by the administration against the western roads, as heretofore announced. After long discussion, in which four members of the Cabinet and two members of the Interstate Commerce Commission participated, the railway men, acting for all the roads against which the injunction had been issued, agreed to suspend those advances which were enjoined until after Congress shall take action on the bill which is now before it; and President Taft agreed to refrain from prosecuting the injunction suit. The President, as above noted, sent a message to Congress designed to hasten action. On the following day the President conferred with Messrs McRea, of the Pennsylvania; Brown, of the New York Central, and Finley, of the Southern, and these three, speaking for the eastern lines, agreed also to suspend the tariffs which have recently been issued, as well as any other action looking to increase the freight rates, until Congress shall have acted; or, if action should not be taken in Congress by the first of July, the railways would submit any proposed advances to the Interstate Commerce Commission. Mr. Finley said that as yet his road had taken no action looking to increases in rates. The western men told the President that their proposed increases affected only 1½ per cent. of their tonnage.

The judiciary committee of the House has taken action looking to the appointment of a commission to investigate employers' liability and workmen's compensation.

The Congressional proposal to discuss a bill to limit the

power of the courts in the issuance of injunctions is said to have been dropped for the present session.

On Monday the House passed the Stevens bill, H. R. 25,335, regulating the issuance of bills of lading. This proposed law aims to make a carrier responsible for bills of lading, even though an agent issues a bill when no goods have been received. Under the common law, the carrier may, in such a case, deny liability, on the ground that it is not responsible in damages for the unauthorized acts of an agent. The bill also holds a railway liable if it delivers goods for which an order bill of lading has been issued without requiring the surrender of the bill. This bill has been promoted before Congress by the committee of bankers who for many months have been trying to provide better safeguards against the serious frauds that have been committed in connection with bills of lading recently. In this connection it is of interest to note that representatives of the Southeastern Cotton Buyers' Association are going to Europe to try to secure agreement on a plan to have bills of lading certified by a bank at the shipping point.

Some western railway men have been in Washington this week conferring with the Interstate Commerce Commission in regard to a postponement of the date at which some of the requirements of the safety appliance laws shall take effect. These gentlemen also conferred with the commission in regard to the law fixing the standard height of drawbars, and the commission will probably issue a revised order defining more accurately the standard height. Separate heights will be prescribed for railways of 3 ft. and 3½ ft. gages and those of 2-ft. gage.

Advances in Wages of Firemen and Enginemen.

A federal board of arbitration composed of Judge William L. Chambers, Washington, D. C., chairman; W. R. Scott, assistant general manager Southern Pacific, and Timothy Shea, vice-president of the Brotherhood of Locomotive Firemen and Enginemen, on June 4 rendered a decision awarding the members of this organization employed on 49 railways west of Chicago, increases in wages of 10 to 12 per cent. The advances in wages was granted mainly on the ground that the cost of living has increased. The following summarizes the awards made by the board:

Firemen in main line and branch passenger service, an increase of 15 cents per 100 miles or less.

Firemen in through and irregular freight, mixed, work, wreck, gravel, helper, pusher, snow plow and branch service (except Mallet type engine), an increase of 15 cents per 100 miles or less; provided that on coal burning engines firemen in this service shall receive an additional increase of 15 cents per 100 miles or less.

Firemen in local or way freight service, an increase of 25 cents per 100 miles or less over through freight rates established by this arbitration, except on roads having an eight-hour day or 12½ miles per hour basis for such runs. On lines where increased rates of wages are now allowed in local or way freight service over through freight rates such differentials will be maintained.

Firemen on Mallet type engine shall receive $4 per 100 miles or less in all classes of service. This rate shall also apply on lines where the schedules provide for trip basis in helper or pusher service in accordance with rules in effect.

Firemen in yard service shall be granted an increase of 25 cents a day.

Where rate of pay is provided for transfer service, firemen shall be granted an increase of 25 cents per day.

On lines where rates of pay are negotiated through the Brotherhood of Locomotive Firemen and Enginemen committees for hostlers, switch engineers and engine despatchers, such employees shall be granted an increase of 25 cents per day.

The above increases shall be based on rates of pay in effect January 1, 1910, except that the differential as between through and local freight shall be based on the through freight rate established by this arbitration. Overtime shall be paid pro rata.

The arbitrators agreed on nearly all the points decided on, although Mr. Shea filed a dissenting opinion setting forth his reasons for not concurring in some parts of the decision of the majority.

Illinois Central Brings Suit for Alleged Frauds in the Repairing of Cars.

The Illinois Central brought suit on June 6, in the Cook County (Ill) Circuit Court, at Chicago, against some of its former officers and four car equipment companies for alleged frauds against the railway in the repairing of cars. The former officials of the Illinois Central named in the bills are: Joseph E. Buker, formerly superintendent of the car department; William Renshaw, formerly superintendent of machinery; O. S. Keith, formerly superintendent of transportation, and Joseph M. Taylor, formerly general storekeeper. The five companies with which these defendants are alleged to have connived in defrauding the railway are the Blue Island Car & Equipment Company, the Memphis Car Company, the American Car & Equipment Company, the West Pullman Company, formerly the Ostermann Manufacturing Company, and the International Car Company. There was no suit against the Blue Island company, as it had already brought suit against the Illinois Central for an accounting, but the allegations made against this company are similar to those made against the other companies.

An injunction against the Central Trust Company of Chicago was sought to prohibit it from paying any of the $226,000 in cash and notes which it is alleged the West Pullman Company paid to Ostermann and which is now held by the Central Trust Company.

The allegations of the Illinois Central are, in brief, that, about June, 1906, Messrs. Buker, Renshaw, Keith and Taylor entered into a conspiracy to defraud the railway, and in pursuance of this conspiracy recommended that the repairing of cars in the company shops be discontinued and that contracts for the work be given to the five companies mentioned. It is alleged that, this action having been taken, they made an arrangement with the five car companies under which cars were sent to them to be repaired and bills were rendered and paid which were exorbitant. It is also charged that large quantities of paints, oils, ties, lumber, bolts, etc., belonging to the railway were delivered to the car companies and were used in the repair of the railway's cars, after which the railway was charged for them. It is also alleged that the repair companies took parts from some of the Illinois Central cars, used them to replace parts of other cars, and then charged the railway for this. It is alleged that the four officers received stock in the repair companies, for which they paid nothing, and that they received a portion of the moneys said to have been fraudulently obtained from the railways in the guise of dividends on this stock. The total amounts paid to the defendant companies and the amounts of the payments which are alleged to have been obtained by fraud are as follows:

	Amount paid.	Alleged fraudulent.
Blue Island Car & Equipment Co.	$1,460,310	$400,000
Ostermann Co.	2,525,936	750,000
Memphis Car Co.	939,396	300,000
American Car & Equiment Co.	299,230	100,000
International Car Co.	8,882	5,000
Totals	$5,233,754	$1,555,000

Society of Railway Club Secretaries.

The annual meeting will be held at Marlborough-Blenheim Hotel, Atlantic City, N. J., June 18, 1910, at 10 a.m. One of the most important matters to be taken up is a proposed plan for widening the scope of the society, which, if adopted, will result in the organization of the American Association of Railway Secretaries, the membership of which shall be composed of the secretaries of all railroad organizations, except such as are identified with organized labor. In the preliminary submission of this matter to the secretaries, it has met with such favor as to lead to the expectation that a permanent association of the character stated will be formed. For obvious reasons, it is proposed that the secretaries of railway clubs shall continue their present organization known as the Society of Railway Club Secretaries as a railway club section of the general association. It is believed that in the

event of this undertaking being successfully carried out, the proposed association will be of advantage to its members in the solution of problems connected with their work, as well as any other matters of mutual interest. The annual dinner of the Society of Railway Club Secretaries will be held on the evening of June 18, at Atlantic City, time and place to be announced later.

Enrollment M. C. B. and M. M. Conventions.

W. W. Rosser, chairman of the Enrollment Committee of the Railway Supply Manufacturers' Association, has issued a notice asking that all those who reach Atlantic City on or before the evening of Tuesday, June 14, enroll and get their badges on either the afternoon or evening of that day. The enrollment booth will be open until 10 o'clock on Tuesday night. By respecting this request considerable congestion will be avoided on Wednesday morning.

M. M. and M. C. B. Conventions.

The sessions of the conventions will be held in the Greek Temple on the Million-Dollar Pier. The enrollment committee will be located in the entrance to the pier. Members of the associations, immediately upon arrival, should go to the enrollment booth, register and procure membership buttons. Members of the M. C. B. Association should note particularly that there will be a morning and afternoon session each day. Those who are members of both associations and expect to attend both conventions, should register twice, once for each convention. The program is as follows:

M. C. B. ASSOCIATION.

Wednesday, June 15.—Morning Session.

Opening exercises	10:00 a.m. to 11:50 a.m.
Discussion of reports on:	
Nominations	11:50 a.m. to 12:00 m.
Revision of Standards and Recommended Practice	12:00 m. to 12:30 p.m.

Afternoon Session.

Discussion of reports on:	
Train Brake and Signal Equipment	2:00 p.m. to 2:30 p.m.
Brake Shoe Tests	2:30 p.m. to 3:30 p.m.
Rules for Loading Materials	3:30 p.m. to 4:00 p.m.

Thursday, June 16.—Morning Session.

Discussion of reports on:	
Rules of Interchange	10:00 a.m. to 10:30 a.m.
Coupler and Draft Equipment	10:30 a.m. to 11:00 a.m.
Car Wheels	11:00 a.m. to 12:00 m.
Safety Appliances	12:00 m. to 12:15 p.m.
Freight Car Trucks	12:15 p.m. to 12:30 p.m.

Afternoon Session.

Discussion of reports on:	
Splicing Underframes	2:00 p.m. to 2:30 p.m.
Car Framing, Roofs and Doors	2:30 p.m. to 3:00 p.m.
Tank Cars	3:00 p.m. to 3:30 p.m.
Train Pipe and Connections for Steam Heat	3:30 p.m. to 4:00 p.m.

Friday, June 17.—Morning Session.

Discussion of reports on:	
Consolidation of Master Car Builders' and Master Mechanics' Associations	10:00 a.m. to 10:30 a.m.
Classes of Cars	10:30 a.m. to 11:00 a.m.
Salt-water Drippings from Refrigerator Cars	11:00 a.m. to 11:15 a.m.
Mounting Pressures on Wheels and Axles	11:15 a.m. to 11:45 a.m.
Individual paper on "Design of Axle to Carry 50,000 Pounds," by E. D. Nelson	11:45 a.m. to 12:00 m.
Springs for Freight car Trucks	12:00 m. to 12:30 p.m.

Afternoon Session.

Discussion of reports on:	
Train Lighting and Equipment	2:00 p.m. to 2:30 p.m.
Lumber Specifications	2:30 p.m. to 3:00 p.m.
Unfinished business, etc	3:00 p.m. to 3:15 p.m.
Election of Officers	3:15 p.m. to 4:00 p.m.

M. M. ASSOCIATION.

Monday, June 20.

Opening exercises	9:30 a.m. to 10:45 a.m.
Discussion of reports on:	
Mechanical Stokers	10:45 a.m. to 11:00 a.m.
Revision of Standards	11:00 a.m. to 11:15 a.m.
Individual paper by W. S. Hayes on "Fuel Economies"	11:15 a.m. to 12:00 m.
Topical discussions:	
"Self-dumping Ash Cans," by H. T. Bentley, C. & N. W.	12:00 m. to 12:30 p.m.
"Apprenticeship Education," by F. W. Thomas, A., T. & S. F. Ry.	12:30 p.m. to 1:00 p.m.
Discussion of report on:	
Motive Power Development	1:00 p.m. to 1:30 p.m.

Tuesday, June 21.

Discussion of reports on:	
Widening Gage on Curves	9:30 a.m. to 9:45 a.m.
Steel Tires	9:45 a.m. to 10:00 a.m.
Safety Appliances	10:00 a.m. to 10:15 a.m.
Superheaters—Individual paper on "Locomotive Performance Under Different Degrees of Superheat," by Prof. C. H. Benjamin, Purdue University	10:15 a.m. to 12:00 m.
Individual paper on "Locomotive Frame Construction," by H. T. Bentley, C. & N. W. Ry.	12:00 m. to 12:30 p.m.
Report of Committee on Safety Valves	12:30 p.m. to 1:00 p.m.
Report of committee on:	
Lumber Specifications	1:00 p.m. to 1:30 p.m.

Wednesday, June 22.

Discussion of report on:	
Train Brake and Signal Equipment	9:30 a.m. to 10:00 a.m.
Individual paper on "Freight Train Resistance," by Prof. E. C. Schmidt, University of Illinois	10:00 a.m. to 11:00 a.m.
Discussion of reports on:	
Locomotive and Shop Operating Costs	11:00 a.m. to 11:45 a.m.
Design, Construction and Inspection of Locomotive Boilers	11:45 a.m. to 12:00 m.
Consolidation of Master Mechanics' and Master Car Builders' Associations	12:00 m. to 12:15 p.m.
Resolutions, Correspondence, etc.	12:15 p.m. to 12:30 p.m.
Election of Officers	12:45 p.m. to 1:30 p.m.

Terminal Officers' Association of Chicago.

The Terminal Officers' Association of Chicago, composed of terminal superintendents, trainmasters, general yard masters, and other railway officials in charge of terminal trains and yard operation, has been organized. Its object is to bring the railway companies having terminals in Chicago "into closer and more effective relationship as regards the conducting of terminal business of mutual interest, through an organization composed of officials actively concerned in the directing of terminal operations." W. D. Dunning has been elected president of the association, and W. B. Gibbs secretary.

American Street and Interurban Railway Association.

The annual convention of the American Street and Interurban Railway Association will be held at Atlantic City, N. J., October 10 to 14, inclusive. The exhibits of the Manufacturers' Association will be held on the Million Dollar Pier.

Western Society of Engineers.

F. Darlington, of Pittsburgh, read a paper before the Western Society of Engineers on June 7 on "The Economic Considerations Governing the Selection of Electric Railroad Apparatus."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'NS.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues; N. Y.; May 31-June 3; Atlantic City.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
BUFFALO TRANSPORTATION CLUB.—J. N. Sells, Buffalo.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; Thursdays; Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
GENERAL SUPERINTENDENTS' ASSOC. OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit. Mich.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; 2d Wed.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
RAILROAD CLUB OF KANSAS CITY.—Third Friday in month; Kansas City.
RAILWAY ASSOCIATION OF SPECIAL AGENTS AND POLICE OF U. S. AND CANADA.—W. C. Pannell, Sec'y-Treas., Sou. Ry., Baltimore, Md.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; regular meeting, June 14; New York.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RY. FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Sta., Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASSOC. OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
TRANSPORTATION CLUB OF TOLEDO.—L. G. Macomber, Woolsen Spice Co., Toledo.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

An officer of the Western Pacific announces that through passenger trains will begin running over that road in August.

In the province of Quebec a law has been passed requiring that after January 1, 1911, railway tickets, bills of lading and other papers to be used by the public shall be printed in both the French and the English languages.

It is given out at Ottawa that the Railway Commission of Canada has been negotiating with the Interstate Commerce Commission of the United States with a view of attempting regulation of rates on trans-Atlantic steamship lines. It appears that the co-operation of the British government in London is to be sought.

The Pennsylvania has announced increases in season-ticket fares between New York City and stations within 60 miles, or thereabouts. The increases vary from nothing to 20 per cent., but in most cases they are about the same as those heretofore announced by the Central of New Jersey; that is to say, not over 4 or 5 per cent.

The Spokane, Portland & Seattle has announced reductions in rates on wool to the Atlantic seaboard, taking effect July 8, and the Oregon Railroad & Navigation Co. has followed with a similar reduction. Some of the new rates are: From the Dalles, $1.43 per 100 lbs.; from Pendleton, $1.38; from Heppner, $1.80; from Enterprise, $2.32.

The Atchison, Topeka & Santa Fe has established an agricultural department, at the head of which will be Professor J. T. Tinsley, formerly connected with the New Mexico Agricultural College. Experiments will be conducted extensively in all sections reached by the Santa Fe system, including regions where only "dry farming" can be successful.

The Rock Island lines have made several changes in the schedules of their through passenger trains. They now have morning, noon and night service from Chicago to Colorado points. The "Mountaineer" will leave Chicago at 1.25 p.m., reaching Denver the following afternoon at 5.20. The "Rocky Mountain Limited" and the "Colorado and California Express" will continue to run on their present schedules with the exception that the former train eastbound will leave Denver at 9 a. m., reaching Chicago in time for connection with the 18-hour trains for the East. A new train, "The Twin City Special," will leave Chicago at 6 p. m. for St. Paul and Minneapolis, arriving at St. Paul at 8 a. m. Announcement is also made that the running time between Kansas City and St. Louis will be shortened almost an hour.

On Thursday of last week the steamship City of Montgomery, of the Savannah Line, sailing from New York to Savannah, carried a shipment of 5,000 bales of cotton which was grown in the southern states, had been sold and delivered in England, and subsequently was bought there by Americans for use in mills in the South, where there is a scarcity because of the large quantities that have been sold for delivery in May and June. The City of Montgomery is a new vessel, the largest freight carrier in the Atlantic coastwise service, and fitted with the finest passenger accommodations of any vessel plying between New York and any port north of Key West.

The eastern trunk lines last week filed with the Interstate Commerce Commission at Washington tariffs showing increased freight rates on a large number of commodities to Chicago and other western points. From the sample items which have been published it appears that most of the increases range between 5 and 10 per cent. For example, taking from New York to Chicago, we find:

	Rate.	
	Old.	New.
Bagging	30	33
Mahogany	25	27
Starch	25	27

Many of the items which are published represent commodities which do not move in any great volume from the Atlantic seaboard to the West, and, therefore, it is impossible to make any estimate of the probable effect of the changes in the rates. Notices were also given of advances between Chicago and the Ohio river; but, as will be seen by our Washington letter, all these advances probably will be postponed.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 71-A, giving a summary of car shortages and surpluses by groups from January 20, 1909, to May 25, 1910, says:

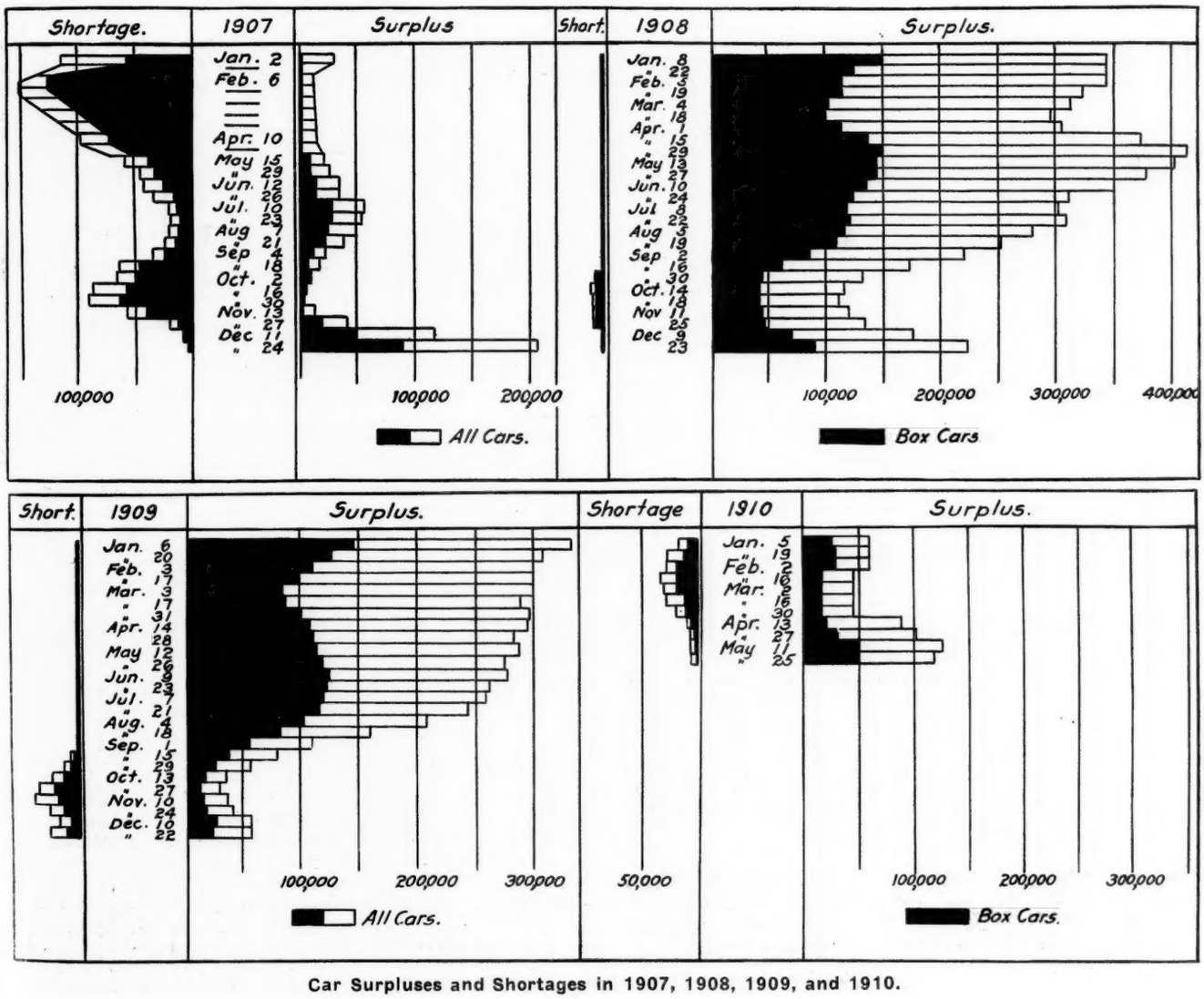
"The total surplus reported for this period is 115,390, a decrease of 11,758 cars. The box car surplus shows an increase of 3,330, while coal cars decreased 16,174. Flats and miscellaneous cars are about stationary. The heaviest decrease is in group 6 (Northwestern), where both box and coal show decreases of 50 per cent. and 40 per cent. respectively. Group 3 (Central), which reports the next largest decrease, follows the grand totals more closely, the box car surplus in this territory having increased, while coal cars decreased about 50 per cent. There is little change in the shortage, which totals 4,729 cars, as against 4,555 in our last bulletin."

The accompanying table gives surpluses and shortages by groups on May 25, and the charts show total bi-weekly freight car surpluses and shortages in the years 1907, 1908, 1909 and 1910.

CAR SURPLUSES AND SHORTAGES.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—May 25, 1910	8	20	2	77	77	176	138	301	75	17	531
" 2.— " 25, 1910	21	7,128	131	4,787	10,999	23,045	...	20	8	4	32
" 3.— " 25, 1910	22	16,180	871	9,429	3,371	29,851	31	100	475	115	721
" 4.— " 25, 1910	10	1,384	38	388	966	2,776	223	442	1,225	30	1,920
" 5.— " 25, 1910	20	3,050	131	2,422	1,269	6,872	...	243	...	...	243
" 6.— " 25, 1910	17	4,034	397	3,152	3,325	10,908	837	21	20	14	892
" 7.— " 25, 1910	4	1,524	72	188	1,091	2,875	...	...	...	...	...
" 8.— " 25, 1910	15	6,837	497	6,407	4,088	17,829	2	...	19	4	25
" 9.— " 25, 1910	8	1,795	262	632	1,276	3,965	...	...	...	...	...
" 10.— " 25, 1910	24	4,517	858	2,391	6,176	13,942	15	13	15	28	71
" 11.— " 25, 1910	5	1,857	25	15	1,254	3,151	170	96	...	28	294
Grand total	154	48,326	3,284	29,888	33,892	115,390	1,416	1,236	1,837	240	4,729

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4— West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and North and South Dakota lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; and Group 11—Canadian lines.



Car Surpluses and Shortages in 1907, 1908, 1909, and 1910.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1910.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Atchison, Topeka & Santa Fe	7,459	$5,168,460	$1,837,190	$7,917,792	$1,466,274	$1,151,515	$159,867	$2,336,683	$178,315	$5,292,654	$2,625,138	.....	$273,816	$2,351,322	—$256,000
Atlantic Coast Line	4,483	1,992,234	603,725	2,812,401	330,838	342,772	41,117	837,677	76,292	1,628,696	1,183,705	.....	95,500	1,088,205	304,304
Boston & Maine	2,242	2,146,081	1,119,737	3,539,685	377,855	459,994	43,478	1,499,346	84,282	2,464,955	1,074,730	$1,107	165,489	910,348	7,455
Central R.R. of New Jersey	668	1,724,354	349,850	2,185,003	208,379	328,197	25,652	556,824	40,100	1,159,152	1,025,851	—11,653	85,320	928,878	14,584
Chesapeake & Ohio	1,938	2,192,484	407,107	2,700,953	326,971	496,386	45,534	732,625	53,339	1,654,855	1,046,098	—2,285	80,500	963,313	171,204
Chicago & Eastern Illinois	965	538,340	150,180	737,747	99,140	129,226	25,224	310,617	31,081	595,288	142,459	—1,075	29,900	111,484	—141,817
Chicago & North Western	7,638	3,854,868	1,307,612	5,787,015	675,591	737,976	94,818	2,537,043	117,759	4,163,187	1,623,828	—7,677	290,000	1,326,151	140,708
Chicago, Burlington & Quincy	9,028	4,521,296	1,687,365	6,803,593	1,486,330	1,114,880	115,420	2,348,306	199,905	5,264,841	1,538,752	—22,518	215,571	1,300,663	460,023
Chicago Great Western R.R.	1,487*	801,091	215,714	1,095,330	167,453	127,779	45,909	482,286	37,371	860,798	234,532	—956	29,043	204,532	.....
Chicago, Rock Island & Pacific	7,393	3,073,592	1,325,045	4,719,460	916,785	747,650	169,714	2,060,360	158,619	4,053,127	666,332	—9,687	237,500	419,145	—671,853
Chic., St. Paul, Minneapolis & Omaha	1,738	828,730	309,416	1,225,920	146,140	149,181	22,144	436,636	26,786	780,887	445,033	—120	60,895	384,008	72,530
Cincinnati, Hamilton & Dayton	1,036	552,428	115,764	758,031	190,990	142,216	24,712	312,113	20,963	690,994	67,037	.....	26,908	40,129	—1,926
Colorado & Southern	1,248	620,350	108,219	769,013	135,200	167,135	15,260	261,974	24,092	603,661	165,352	—1,032	21,823	142,497	23,624
Delaware & Hudson Co.	843	1,380,666	191,822	1,756,841	115,209	227,426	18,440	556,827	38,954	956,856	799,985	—488	35,000	764,498	69,057
Delaware, Lackawanna & Western	930	2,375,415	550,070	3,116,489	286,787	405,531	60,888	818,364	55,657	1,627,227	1,489,262	30,150	118,650	1,400,762	258,020
Denver & Rio Grande	2,517	1,433,282	396,169	1,906,882	222,912	289,658	46,055	632,047	43,333	1,234,004	672,878	417	69,000	604,295	181,489
Erie	1,961	2,708,868	665,763	3,660,379	303,663	675,235	99,480	1,224,559	86,559	2,389,496	1,270,883	—22,312	108,930	1,139,641	182,426
Great Northern	7,129†	3,778,378	1,135,832	5,197,107	1,209,764	718,092	76,587	1,629,400	83,901	3,717,744	1,479,363	—663	263,587	1,215,113	104,062
Gulf, Colorado & Santa Fe	1,518	622,755	221,261	914,830	343,447	186,188	24,314	402,519	32,208	988,676	—73,846	.....	41,208	—115,054	—242,789
Kansas City Southern	827	657,015	115,186	851,247	88,043	98,923	31,510	305,850	31,415	555,741	295,506	.....	29,064	266,442	—7,177
Lehigh Valley	1,441	2,858,492	332,577	3,306,136	276,739	484,731	80,029	909,085	53,541	1,804,125	1,502,011	—26,962	94,600	1,380,449	246,458
Louisville & Nashville	4,594‡	3,202,507	882,294	4,394,263	836,195	798,113	104,636	1,384,860	126,152	3,249,956	1,144,307	27,516	125,580	1,046,243	14,481
Maine Central	932	442,908	210,245	697,894	100,700	108,319	9,538	241,766	25,290	485,613	212,281	459	35,993	176,747	17,452
Missouri, Kansas & Texas	3,072	1,403,043	596,803	2,233,637	401,374	273,379	53,804	971,267	81,052	1,780,876	452,761	1,125	95,000	358,886	—195,986
Mobile & Ohio	1,114	651,556	137,907	927,439	112,208	164,509	31,852	304,852	36,998	650,419	277,020	—4,140	25,196	247,684	17,057
New York, New Haven & Hartford	2,044	2,677,125	1,973,764	5,079,352	714,583	522,971	27,132	1,933,112	123,612	3,321,410	1,757,942	101,228	350,000	1,509,170	93,433
Northern Pacific	5,849§	4,357,400	1,461,719	6,186,156	1,253,092	779,999	83,620	2,070,817	68,245	4,255,773	1,930,383	7,556	404,661	1,533,278	—469,880
Pennsylvania Co.	1,415	2,831,354	605,083	3,771,414	604,755	801,213	70,548	1,425,422	86,287	2,988,225	783,189	—6,424	147,890	628,875	—146,644
Pennsylvania R.R. Co.	3,947	9,374,547	2,507,729	12,730,952	1,660,217	2,707,988	175,331	4,521,678	307,197	9,372,411	3,358,541	—115,817	197,526	3,045,198	135,512
Pere Marquette	2,328	985,073	265,658	1,353,013	151,459	175,681	41,641	547,936	30,477	947,194	405,819	13,220	84,395	334,644	45,744
Philadelphia, Baltimore & Washington	717	795,060	582,963	1,537,829	235,249	270,965	28,566	626,250	32,375	1,193,405	344,424	.....	35,772	308,652	—20,100
Pitts., Cincinnati, Chicago & St. Louis	1,468	2,180,274	600,436	3,119,830	412,682	674,061	67,380	1,164,634	68,248	2,387,005	732,825	—1,099	112,426	619,300	83,049
Southern Ry.	7,050	3,267,422	1,110,780	4,773,435	558,474	855,165	132,576	1,626,840	145,429	3,318,484	1,454,951	9,714	161,967	1,302,698	170,949
Texas & Pacific	1,885	844,883	312,658	1,221,513	150,640	249,489	19,561	564,997	35,246	1,019,923	201,580	—2,249	38,000	161,331	56,962
Union Pacific	3,411‖	2,786,305	818,625	4,012,866	757,969	470,804	92,684	1,077,375	97,803	2,496,635	1,516,231	—8,325	123,250	1,384,656	—92,563
Vandalia	827	433,100	177,573	695,040	160,567	176,062	23,475	293,097	19,670	672,871	22,170	.....	25,199	—3,029	—119,545
TEN MONTHS OF FISCAL YEAR, 1910.															
Atchison, Topeka & Santa Fe	7,459	48,772,549	17,466,287	72,256,896	11,971,998	11,001,583	1,433,487	20,905,405	1,550,506	46,862,979	25,393,917	.....	2,680,506	22,713,411	—1,105,574
Atlantic Coast Line	4,483	17,654,358	5,756,537	25,198,597	3,290,917	3,498,036	415,905	7,590,552	699,593	15,495,003	9,703,594	.....	949,500	8,754,094	1,719,391
Boston & Maine	2,242	21,270,395	12,168,004	36,082,148	4,228,817	4,473,396	422,515	15,747,098	826,741	25,698,567	10,383,581	53,384	1,745,901	8,691,064	804,980
Central R.R. of New Jersey	668	14,923,880	3,692,838	19,670,056	1,667,468	3,162,582	284,520	5,324,545	402,873	10,841,988	8,828,068	173,915	980,169	8,021,814	768,175
Chesapeake & Ohio	1,938	21,022,374	4,112,032	26,171,898	2,737,368	4,886,718	440,171	7,038,769	490,401	15,593,427	10,578,471	—8,807	714,000	9,855,664	2,164,475
Chicago & Eastern Illinois	965	7,971,274	1,546,537	10,030,316	971,926	1,827,833	224,007	3,473,691	322,009	6,819,466	3,210,850	—13,185	302,324	2,895,340	417,878
Chicago & North Western	7,638	41,196,087	15,225,457	61,521,568	8,607,198	7,796,136	1,068,650	24,733,339	1,058,788	43,264,111	18,257,457	—51,791	2,404,000	15,801,666	—1,473,085
Chicago, Burlington & Quincy	9,028	49,295,080	18,634,383	73,951,389	12,569,910	12,849,606	1,375,310	23,408,238	1,863,367	52,066,431	21,884,958	—156,434	2,155,835	19,572,689	58,536
Chicago Great Western R.R.	1,487*	5,860,589	1,672,896	8,121,302	956,457	963,040	333,617	3,572,656	276,895	6,102,665	2,018,637	—11,703	220,448	1,786,486	.....
Chicago, Rock Island & Pacific	7,393	33,422,825	15,387,473	51,915,644	8,590,314	6,944,027	1,362,403	19,802,582	1,449,657	38,148,983	13,766,661	—125,640	2,171,126	11,469,895	—750,762
Chic., St. Paul, Minneapolis & Omaha	1,738	8,148,409	3,611,937	12,642,093	1,536,464	1,442,141	234,835	4,674,568	280,134	8,168,142	4,473,951	—1,390	550,554	3,922,007	355,305
Cincinnati, Hamilton & Dayton	1,036	5,604,821	1,394,642	7,832,331	1,103,349	1,366,400	223,117	3,130,835	250,180	6,073,881	1,758,450	.....	262,586	1,495,864	495,009
Colorado & Southern	1,248	6,421,220	1,341,461	8,170,587	1,091,491	1,348,911	139,198	2,617,591	218,355	5,415,546	2,755,041	—5,721	217,342	2,531,978	405,560
Delaware & Hudson Co.	843	13,293,155	2,439,131	16,586,180	1,016,848	2,204,079	200,349	5,698,174	382,729	9,502,179	7,083,001	—1,018	341,469	6,741,514	520,493
Delaware, Lackawanna & Western	930	22,162,011	5,751,832	29,732,600	2,486,448	4,040,250	538,792	8,070,291	565,253	15,701,034	14,031,566	248,631	1,278,700	13,001,497	1,055,098
Denver & Rio Grande	2,517	28,836,337	4,422,566	38,853,935	2,236,976	3,211,057	415,418	7,022,127	459,336	13,344,914	6,293,539	22,109	683,000	5,632,648	863,723
Erie	1,961	14,402,087	7,148,080	38,638,453	4,063,732	6,933,239	915,477	12,747,933	793,833	25,454,214	13,399,721	—229,924	1,066,786	12,103,011	1,674,037
Great Northern	7,129†	38,079,366	11,773,426	52,699,418	8,278,647	6,280,593	750,480	14,957,577	819,596	31,086,893	21,612,525	226,742	2,876,911	18,962,356	3,107,830
Gulf, Colorado & Santa Fe	1,518	7,037,905	2,485,895	10,188,308	2,267,487	1,587,505	240,585	3,900,378	308,237	8,304,192	1,884,116	.....	353,442	1,530,674	—1,357,827
Kansas City Southern	827	5,902,239	1,175,270	7,861,464	862,316	991,583	262,593	2,717,764	302,287	5,136,543	2,724,921	.....	269,037	2,455,884	—100,182
Lehigh Valley	1,441	25,133,961	3,549,764	29,734,691	2,993,707	4,864,558	744,003	8,789,459	587,247	17,978,974	11,755,717	—56,010	946,000	10,753,707	1,711,128
Louisville & Nashville	4,594‡	32,011,897	8,966,848	43,671,251	5,991,966	6,994,636	927,030	13,171,880	897,741	27,983,253	15,687,998	49,976	1,257,050	14,480,924	2,435,472
Maine Central	932	4,525,153	2,432,806	7,401,425	1,038,846	1,060,774	76,224	2,501,447	223,210	4,900,502	2,500,923	24,982	357,375	2,168,530	348,308
Missouri, Kansas & Texas	3,072	14,791,683	6,433,354	22,689,205	3,385,130	2,797,621	556,446	8,465,209	746,817	15,951,223	6,737,982	—9,101	915,606	5,813,275	262,684
Mobile & Ohio	1,114	6,431,354	1,118,375	8,786,381	1,046,509	1,586,559	305,074	2,867,809	324,635	6,130,586	2,655,795	—26,248	224,927	2,404,620	—57,637
New York, New Haven & Hartford	2,044	24,833,740	20,577,616	49,874,220	5,541,705	5,451,860	261,446	19,050,980	1,263,376	31,569,367	18,304,853	1,083,082	3,305,000	16,082,936	3,712,886
Northern Pacific	5,849§	39,721,826	17,827,994	61,191,356	8,429,160	7,564,078	833,465	19,995,973	884,348	37,707,024	23,484,332	567,024	2,874,514	21,176,842	—2,851,371
Pennsylvania Co.	1,415	33,834,109	6,294,608	43,499,271	5,709,580	7,195,923	699,779	14,106,855	761,056	28,473,193	15,026,078	—36,746	1,481,044	13,508,288	3,445,687
Pennsylvania R.R. Co.	3,947	98,816,547	25,873,715	133,124,903	16,186,734	25,128,469	1,668,839	44,532,581	3,089,547	90,606,170	42,518,733	—1,072,152	1,975,262	39,471,320	8,244,200
Pere Marquette	2,328	9,295,443	3,107,032	13,373,900	1,610,048	1,734,998	347,386	5,328,525	297,906	9,318,863	4,055,037	35,489	586,354	3,504,172	613,348
Philadelphia, Baltimore & Washington	717	7,411,884	5,911,849	14,798,848	2,171,947	2,546,140	246,812	5,827,499	320,017	11,112,415	3,686,433	.....	357,716	3,328,718	327,494
Pitts., Cincinnati, Chicago & St. Louis	1,468	23,213,912	6,258,985	32,984,888	4,501,130	5,773,872	680,234	11,009,672	602,395	22,567,308	10,417,585	—8,763	1,107,271	9,301,551	2,091,749
Southern Ry.	7,050	32,153,153	12,225,275	48,108,961	5,625,638	8,235,644	1,168,946	15,820,536	1,441,690	32,292,455	15,816,506	18,047	1,658,281	14,176,272	1,577,301
Texas & Pacific	1,885	9,218,995	3,312,459	13,424,514	1,572,696	2,073,796	206,185	5,178,963	994,021	22,343,134	4,050,079	—27,712	473,647	3,548,720	420,704
Union Pacific	3,411‖	31,260,125	9,066,062	44,062,357	4,653,554	4,791,363	1,103,562	10,800,634	342,795	9,374,435	4,050,079	—48,752	1,298,026	20,372,445	1,500,813
Vandalia	827	5,418,996	1,854,350	8,135,180	1,218,244	1,495,557	241,754	2,966,977	191,950	6,114,482	2,020,698	.....	243,273	1,777,425	192,509

* Began operations Sept. 1, 1909; for previous returns, see Chicago Great Western Ry. † Mileage operated on April 30, 1909, 6,960 miles. ‡ Mileage operated on April 30, 1909, 4,388 miles. §Mileage operated on April 30, 1909, 5,695 miles. ‖ Mileage operated on April 30, 1909, 3,310 miles. —— Indicates Deficits, Losses and Decreases.

Controversy and Litigation Over Advances in Railway Rates.

Conferences on Monday at Washington, as noted elsewhere, have settled it that there will be no more important advances in freight rates without previous approval of the Interstate Commerce Commission. On the evening of May 31 Judge Dyer, of the United States district court, issued an injunction at Hannibal, Mo., restraining the western railways from putting into effect on June 1 advances in rates which were provided for by Tariff A114, which had been filed some weeks before with the Interstate Commerce Commission. The petition which led to the issuance of this injunction was signed by Attorney-General Wickersham and was filed for him by Frederick N. Judson, of St. Louis, acting as special counsel for the government. It alleged that the advances in rates in question were made by agreement in violation of the Sherman anti-trust law and attacked the Western Trunk Line Committee, through which the advances have been announced, as an illegal organization and all the rates in question as illegal because they had been made by concerted action of the carriers.

Immediately following the issuance of this injunction there were reports that railways all over the country would order severe retrenchments and the stock market was greatly demoralized. The prices of even the best railway securities declined heavily and negotiations for the sale of additional securities in United States and Europe were suspended.

STATEMENT BY E. P. RIPLEY.

Speaking of the general situation as related to the government's application to the court, President Ripley, of the Atchison, Topeka & Santa Fe, said:

"It is true that there is a direct conflict of statement between the railways and the shippers as to the condition of railway earnings.

"In their resolutions adopted at Chicago May 7, the shippers make the bald statement that an analysis of the figures of the Interstate Commerce Commission indicates that the net income per mile of road for 1907 has increased 345 per cent. over 1897. Also that the returns for the first seven months of the fiscal year 1909-1910 show a substantial increase in net operating income, thus indicating a healthy growth of business and relatively cheaper operating cost.

"Now, these statements are absolutely untrue, and the shippers have been deceived by those who made the computations. Where the returns for the calendar year 1907 showed earnings from operation of $11,548 per mile, those for 1909 showed only $11,086, or $462 less, per mile. For the first three months of the calendar year 1910 the returns show gross earnings of $2,734 per mile, against $2,618 for the corresponding months of 1907, or a gain of $116 per mile. But any elation over this improvement is chastened by the fact that the expenses have increased from $1,770 per mile for the three months of 1907 to $1,927 for 1910, causing a net loss of $41 per mile. There is no chance for juggling with figures or deception on the railroad side—every item of our business is spread before the world. Our gross earnings are increasing, but our net earnings are declining.

"But that isn't the worst of it. Such results as are now being obtained—poor as they are—arise from policies that are cumulative in evil for the future, because the properties are not being improved or even kept up to the proper standard. If we are fortunate enough a few years hence to have full crops and active business, and if the railways are then unable to do what they are expected to do, these same shippers will perhaps perceive that they ought to have seconded rather than opposed the efforts of the railways for better conditions. And again that isn't the worst of it—we have recently increased wages to a large amount, and the decrease in net earnings will surely be greater.

"I am not alluding especially to Atchison conditions. Our directors have been conservative and our stockholders have spent on our property much money that they might properly have claimed in dividends, but even the strongest among us cannot stand under present conditions, and the weaker will, of course, drop first."

J. E. Wilder, of the shippers' committee, which was appointed to oppose advances in rates, made public a letter received from President Delano of the Wabash in response to the committee's proposition to submit advances in rates to arbitration by the Interstate Commerce Commission.

STATEMENT BY F. A. DELANO.

Mr. Delano pointed out that shippers have a right under the law to complain of a rate, and the Interstate Commerce Commission is required to hear the complaint. "This being the case, it would simply be a work of supererogation on my part or that of any railway official to say that we would submit this case to arbitration. You have the right to demand an inquiry, and the Interstate Commerce Commission has the right to determine whether the rates proposed are proper or not. Speaking for myself, I am not afraid to have this matter thoroughly ventilated and all the cards placed face uppermost upon the table. I, and others as well, fear only the result of delay. We do not want to wait until we are in the bankruptcy courts before we are permitted to adjust rates to our requirements.

"It should be borne in mind, furthermore, that an arbitration by the Interstate Commerce Commission, while binding the railways parties to it, would not bind any shipper except those subscribing to the arbitration and, regardless of the decree made by the commission in regard to the general policy, would not bind the commission in respect to any particular rate or discrimination complained of by any shipper. Considering this, the result of arbitration in this case would be futile and of no avail.

"It is probably safe to say that the members of your association who have signed the protest are quite as large, if not larger, owners of railway securities as the men to whom your appeal is addressed. I mention this simply to point out to you that the railway officials addressed are not serving their own selfish interests in urging an advance in rates, but are acting as the paid trustees of all the stockholders, and as such, held responsible by their boards of directors for the honorable and efficient discharge of their duties. These duties, in a general way, require that they shall give adequate service to the public; that they shall deal fairly with their employees; that they shall make an honest return to the creditors of the railway—which includes not only the holders of their mortgages (bondholders), but also the creditors for their supplies; and that they shall finally report, through the directors, to the stockholders, the virtual owners of the property.

"In these several duties these executive officers are subject to supervision on behalf of the public and the employees by legally constituted authorities—the Interstate Commerce Commission, and the commissions of the several states. In respect to the owners of the property and to the creditors of the railways, they are under supervision by the creditors themselves, acting directly through their attorneys and representatives, as provided under the laws of the various states and the federal government, which in a general, and sometimes a very specific way, protect them in their rights. In short, the railway officials of the country are made fully accountable and responsible under the law.

"If the rates proposed cannot be defended, they will be leveled down; but I, for one, am unwilling to accept the responsibility and accountability required under the law if all authority in the making of rates is taken away from me. It isn't fair, Mr. Wilder, (and I think you will agree with me) that we should be held responsible for the payment of all the bills, the salaries of employees and many other requirements and at the same time be deprived of any control over our income. Men who have given their lives to the study of this question think they know what they need, and I may be permitted to remark that the bankers who loan us money and the business houses who sell us materials do not submit to arbitration the question of what we shall pay them.

"It is argued by some of the gentlemen who have joined you in making this appeal that class rates are high enough and that it is commodity rates which should be advanced. In response to this, I can state that my own judgment is that both class and commodity rates are in many cases too low. In an endeavor to readjust matters, I have had in mind two cardinal principles; *first*, that no rates should be made below the actual cost of transportation; *secondly*, that as all commodities cannot make the same contribution towards the renewal and depreciation accounts and towards the interest

on the capital invested, the amount which should be charged over and above the actual cost of service must vary somewhat in proportion to the value of the article, favoring at all times raw materials as against finished products, and finished products handled in large quantities as against those which are luxuries and are handled in small quantities.

"Bearing these principles in mind, it is my conviction that the rates on the higher classes of L.C.L. business between New York and Chicago, which form the basis of all rates in the territory east of the Mississippi river and north of the Ohio, are very considerably too low: That considering the fact that rates on many of the low class commodities cannot or should not be advanced, and that these commodities should be carried in the future as they have been in the past, at very near cost; and considering the further fact that the relative movement of the high-grade commodities is small as compared to that of the low-grade commodities, it is not too much for the railroads to ask that the first-class L.C.L. rates should be advanced 20 per cent. In connection with this statement, it should be borne in mind that, measured in money, railway rates have in the last few years remained about stationary on the average. Measured in the things bought with money they have greatly declined.

"I notice by the public prints that you hold the Wabash up as a shining example of a road which has made large gains in its net earnings in the last eight months. This is true because we are comparing with the two poorest years in our history, and had we not shown a considerable gain, we should be facing a very serious situation to-day. In the year ending June 30, 1908, with the most stringent economy, neglecting every expenditure which was not demanded by the requirements of safety, we ended up the year with a deficit of $250,000 below our fixed charges. The year following was slightly better, the deficit being approximately $150,000. In these two years our income mortgage bondholders received no return on their investment. The holders of the preferred stock and common stock did not receive, and have never received since the road was reorganized twenty years ago, a dollar on their investment.

"The necessity of maintaining credit has made it necessary for all the railways to say as little as possible about their misfortunes and to make the most of their prosperity, but the tremendous advances in the prices of materials and the increases in wages which are just becoming effective have so far altered the situation that it is little short of desperate, and some means of obtaining increased revenues is absolutely necessary."

Cotton Crop Conditions.

The crop reporting board of the United States department of agriculture estimates that the area planted to cotton this year (1910) in the United States, including that already planted and expected to be planted, is about 102.8 per cent. of the area planted to cotton last year, equivalent to about 33,196,000 acres, as compared with 32,292,000 acres indicated by the bureau's revised estimate of last year's planted area, an increase of about 904,000 acres, or 2.8 per cent.

The condition of the growing crop on May 25 was 82.0 per cent. of a normal condition, as compared with 81.1 per cent. at the corresponding date in 1909, and 80.9 per cent., the average condition for the past ten years on May 25. Details by states follow:

States.	Rev. figures indicating acres planted in 1909.	Area planted in 1910, preliminary estimate.— Per ct.*	Acres.	Condition May 25 1910.	1909.	10-year av'ge.
Virginia	26,000	130	34,000	90	85	86
North Carolina	1,420,000	104	1,477,000	84	83	83
South Carolina	2,550,000	102	2,601,000	78	83	82
Georgia	4,763,000	101	4,811,000	81	84	82
Florida	250,000	108	270,000	80	91	87
Alabama	3,570,000	102	3,641,000	83	83	80
Mississippi	3,450,000	96	3,312,000	82	78	80
Louisiana	1,100,000	99	1,089,000	76	74	80
Texas	10,100,000	104	10,504,000	83	78	78
Arkansas	2,375,000	103	2,446,000	81	84	82
Tennessee	754,000	103	777,000	86	85	83
Missouri	84,000	105	88,000	87	93	85
Oklahoma	1,850,000	115	2,128,000	84	84	84
California	.....	..	18,000	90	..	..
United States	32,292,000	102.8	33,196,000	82.0	81.1	80.9

*Compared with 1909.

INTERSTATE COMMERCE COMMISSION.

Reparation Awarded.

William K. Noble v. Toledo & Western et al. Opinion by Commissioner Clark.

Railway's mistake in misrouting. (18 I. C. C., 494.)

Complaint Dismissed.

Snyder-Malone-Donahue Co. v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Clark.

Carload rate on cattle from South Omaha, Neb., to Cushman, Mont., is not unreasonable. (18 I. C. C., 498.)

Storage-in-Transit on Rice.

Bayou City Rice Mills et al. v. Texas & New Orleans et al. Opinion by Chairman Knapp.

Millers of rice at Houston, Tex., complain that they are subjected to disadvantage because storage-in-transit and reconsignment privileges are provided at Houston on rice destined to New Orleans, La., while similar privileges are denied at Louisiana points on rice destined to Houston; and by the maintenance of a rate of 19 cents from Houston to New Orleans while according a rate of 15 cents from Clinton, Tex., a point about eight miles south of Houston, the traffic from Clinton passing through Houston to reach New Orleans. We are not warranted in finding that there is any unjust discrimination because of the failure of rail lines reaching New Orleans to provide for transit privilege on shipments of rice from New Orleans to Texas, and a prima facie case of dissimilarity of conditions between Houston and Clinton under the fourth section has been made. As the facts now appear no order which might disturb the whole system of rice rates in that section of the country will be entered. Complaint dismissed without prejudice. (18 I. C. C., 490.)

STATE COMMISSIONS.

The South Dakota Railroad Commission has moved its office from Sioux Falls to Pierre, where it will be quartered in the new state house.

The Railroad Commission of Louisiana has ordered that the minimum weight to be applied on carload shipments of household goods and emigrant movables be fixed at 20,000 lbs.

The Railroad Commission of Louisiana has ordered that within switching limits at Lake Charles all interchange switching of cars shall be executed within 36 hours from the time the switching order is filed, except for unavoidable cause of delay.

By a general order taking effect June 10, the Oklahoma State Corporation Commission repeals all orders affecting the concentration and compressing of cotton. The difficulties of managing this matter are so great that the commission finds itself unable to cope with them.

The Railroad Commission of Louisiana has ordered put into effect a comprehensive reduction in both class and commodity rates between New Orleans and Winnfield. The class rates put into effect are as follows: First class, 80 cents per 100 lbs.; second class, 70 cents; third class, 60 cents; fourth class, 45 cents; fifth class, 34 cents; A class, 35 cents; B class, 30 cents; C class, 27 cents; D class, 26 cents; E class, 25 cents.

Wisconsin: Petition for Added Facilities.

Charles Pischel v. Chicago, St. Paul, Minneapolis & Omaha.

The petition asks for the building of a depot and maintenance of an agent at Lampson. The evidence shows that the cost of building this station and the maintenance of a regular agent would probably absorb at least the total revenue from the station, making due allowance for operating expenses. The petition is denied. (4 W. R. C., 783.)

COURT NEWS.

The Missouri River Rate Case.

The Interstate Commerce Commission v. the Chicago, Rock Island & Pacific et al. Burnham, Hanna, Munger Dry Goods Co. et al. v. the Chicago, Rock Island & Pacific et al. Opinion by Justice McKenna, U. S. Supreme Court.

The question in the case is the validity of an order of the Interstate Commerce Commission reducing the class rates charged by the appellee railway companies on through freight shipped from the Atlantic seaboard to Kansas City, and St. Joseph, Mo., and Omaha, Neb., cities on the Missouri river and called throughout the record, and in this opinion, Missouri River Cities.

The reduction was made in that part of the through rate which applied to the haul between the Mississippi and Missouri rivers. Explaining its order of reduction, the commission said the through rates from Atlantic seaboard terminals to the Missouri river cities are made by adding together the rates from points of origin to the Mississippi river crossings, using proportional rates when such were available, and the local rates from the Mississippi crossings to the Missouri river cities. The through rates the commission pronounced to be unreasonably high, "because those portions of the through rates which apply between the Mississippi river crossing and the Missouri river cities are too high. These are defendants' 'separately established rates,' which are 'applied to the through transportation,' and, therefore, the through rates should be adjusted by reduction of those factors or parts thereof which are found to be unreasonable."

The circuit court in granting an injunction restraining the Interstate Commerce Commission from enforcing its order said that the differential of 9 cents on merchandise from the Atlantic seaboard to the Missouri river cities, whatever be the principle upon which the order was based, will be "to protect to a certain degree the Missouri river jobbers and manufacturers within a certain zone of territory against the jobbers and manufacturers of Central Traffic Association territory * * * as also to open up to the Atlantic seaboard," in its trade with the Missouri river, "zones of territory, the advantages contained in the differential against the competition of both the intervening Central Traffic Association territory and the Missouri river territory." And this, it was asserted, was the exercise of a "power artificially to apportion out the country into zones tributary to given trade centers, to be predetermined by the commission, and non-tributary to others." This, it was further said, was a "power essentially different in principle from the mere power of naming rates that are reasonable."

We make these quotations from the opinion of the court because they put, in a clear and condensed way, the ultimate contention of the companies and the evil, as they see it, in the order of the commission, and which is intended to be exhibited by their voluminous pleadings and arguments. And such, it is insisted, was the conscious purpose of the commission, a view in which the circuit court concurred, deducing it from certain avowals of the commission in its report.

Such purpose and the want of power in the commission to execute it is the foundation of the court's opinion.

Is it true that the Interstate Commerce Commission by its order exercised a power "artificially to apportion out the country into zones tributary to given trade centers," and intentionally exercised it to protect the Missouri river cities against the competition of other cities? If that be the necessary conclusion the judgment of the circuit court it may be contended was right. Such conclusion we should certainly be reluctant to adopt. From whatever standpoint the powers of the Interstate Commerce Commission may be viewed, they touch many interests, they may have great consequences. They are expected to be exercised in the coldest neutrality. The commission was instituted to prevent discrimination between persons and places. It would indeed be an abuse of its powers to exercise them so as to cause either.

The outlook of the commission and its powers must be greater than the interest of the railways or of that which may affect those interests. It must be as comprehensive as the interest of the whole country. If the problems which are presented to it therefore are complex and difficult, the means of solving them are as great and adequate as can be provided.

We return therefore to the question of the power of the commission and its purpose. The complainant before that body presented two issues, the effect of the rates from the Atlantic seaboard as discriminating against the Missouri river cities in favor of St. Paul and Minneapolis, and their unreasonableness of and in themselves. The first we may immediately put out of view. It was decided adversely to the complainants before the commission, and we may say at the outset that the contention of the railway companies that it was the only issue presented to the commission is not justified.

The second issue was decided in favor of the complainants, the commission finding that the through rates were unreasonable of and in themselves, and was caused by the charge from the Mississippi river crossings to the Missouri river cities.

It is certain that the subject has taken on more complexity than it had before the Interstate Commerce Commission, and the commission has made this the basis of a motion to dismiss the suit as to the intervening railways, and all the intervening merchants and manufacturers, on the ground as to the railways, among others, that the order does not run against or operate upon them, and that no right of theirs can be determined by the decree. On the ground as to the intervenors, that over the matters herein the courts exercise only the jurisdiction conferred by the act to regulate commerce, and not general equity powers, and that the matter to be determined is not the respective rights of shippers or localities, but the validity of the order of the commission, and that the intervenors have a complete remedy by application to the commission. And we may say here, as adding to the complex effect and interest of the questions presented, that the chambers of commerce and boards of trade of certain Eastern cities have presented a brief in defense of the order, asserting a vital interest in its preservation, and exhibiting and illustrating the discrimination, as they contend, exists against them by the breaking of rates.

Let us see, therefore, upon what grounds the commission proceeded. The commission is accused by the railways of attempting to substitute an artificial system of ratemaking for a long-established system, and to protect or foster particular localities of production and distribution. Certain remarks of the commission are cited to support the charge. We think the charge puts out of view all else that was said by the commission, puts out of view the comprehensive consideration the commission took as exhibited in the explicit declaration made after quoting the local class rates between the rivers in cents per hundred pounds, that "these are the rates that are added to the rates up to the Mississippi river crossings to make up the through rates from the Atlantic seaboard to the Missouri river cities. Are these rates, as so used, and the through rates resulting therefrom, unwarrantably high or unduly discriminatory or unjustly prejudicial? Can they be changed without doing injustice elsewhere?"

We think the charge also puts out of view the disclaimers of such purpose in the answer of the commission in its report to Congress, and its insistence that it is constrained by the law to act only on complaint to it and that it is open at all times to be appealed to redress the grievances any shipper or locality may have. Nor did the commission ignore or underestimate the manner in which the lines of railways had been extended or the system of rates or ratemaking which had resulted. That is the system of making rates upon certain basing lines or points. Rates "break" at such points, it was proved, as a result of building independent lines westward.

It was the sense of the commission, however, that such points could not be immovable forever and fixed forever against power of changing, or that through rates based on such points must be exempt from regulation, no matter what their character, or be constituted at the will of the railway of the sum of local rates or the sum of rates from one basing point to another, however unjust the rates might be. Indeed, as pointed out in the brief of the appellants in No. 664, the railway companies adhere to no such construction of rates. As there said, "the Pacific coast terminal rates, the Washington and Spokane common point rates, the Oklahoma rates

and the El Paso and Texas common point rates are each and all a departure therefrom, and all are much less than the rates ordered by the commission."

As we have said, the commission is the tribunal that is intrusted with the execution of the interstate commerce laws, and has been given very comprehensive powers in the investigation of and determination of the proportion which the rates charged shall bear to the service rendered, and this power exists, whether the system of rates be old or new. If old interests will have probably become attached to them and, it may be, will be disturbed or disordered if they be changed. Such circumstance is, of course, proper to be considered and constitutes an element in the problem of regulation, but it does not take jurisdiction away to entertain and attempt to resolve the problem. And it may be that there cannot be an accommodation of all interests in one proceeding. This the commission has realized and expressed. The commission, meeting a possible suggestion that if the part of the through haul, which consisted of the rate between the rivers, was too high, all rates between the rivers might be too high, said:

"If the local class rates of defendants between the Mississippi and Missouri rivers were reduced, it would give the same degree of advantage to all the producing and distributing centers on and east of the Missouri river, and their relative advantages or disadvantages would not be changed, while a very serious inroad upon the revenues of the carriers would inevitably result, and at a time of industrial depression when it could not well be borne. Such a change would necessitate corresponding changes in the rates to and from intermediate points, and would probably be reflected in changes in commodity rates as well. The local class rates between the rivers are high, but this is not the time to precipitate such a violent change as would follow an important reduction of them. The first class rate from Buffalo to Chicago, about 540 miles, and from Pittsburgh to Chicago, about 465 miles, is 45 cents. From Cincinnati to Chicago, 306 miles, it is 40 cents."

We may say in passing that the passage thus quoted is one of those which is adduced to support the contention that the commission's purpose was to introduce a new system of rate-making and build up certain distributing centers. We do not think so. It only shows that the accusation that all rates between the rivers were too high might be justified, but that it would be unjust to the carriers to reduce them at that time. It is somewhat strange that that which was done in the interest of the carriers should be brought forward by them to attack the action of the commission. It is very clear that by a voluntary reduction by them of such rates the equality of opportunity dependent upon them would be restored. We make this observation to bring out clearly the relation of the railway companies to the grievance complained of. That the companies may complain of the reduction made by the commission so far as it affects their revenues is one thing. To complain of it as it may affect shippers or trade centers is another. We have said several times that we will not listen to a party who complains of a grievance which is not his. *Clark v. Kansas*, 176 U. S. 114, 118; *Smiley v. Kansas*, 196 U. S. 774.

But, it may be said, such limitations upon the companies is not of consequence, for shippers and trade centers are here with complaints. It is doubtful if they are properly here, or rather were properly permitted to intervene. We have said that the act to regulate commerce was intended to be an effective means for redressing wrongs resulting from unjust discrimination and undue preference, and this must be so, whether persons or places be sufferers. *T. & P. Railway Co. v. Abilene Oil Co.*, 204 U. S. 426. We have also said that the primary jurisdiction is with the commission, the power of the courts being that of review and is confined in that review to questions of constitutional power and all pertinent questions as to whether the action of the commission is within the scope of the delegated authority under which it purports to have been made. *Interstate Commerce Commission v. Illinois Central R. R. Co., supra.*

The order of the commission besides is strictly limited. It was intended to determine nothing, and it determines nothing but that the through rates on Atlantic seaboard shipments to the Missouri river cities are too high. That order is alone open to review. Whether other persons, cities or areas of territory have grounds of complaint, the way is open by application to the commission for inquiry and remedy. In that inquiry many elements may enter upon which the judgment of the commission should first pass, and of which the courts should not be called upon in advance to intimate an opinion. The reasons for this we have indicated, and they will be found at length in the cases which we have cited.

One question remains for discussion, the finding of the commission upon the character of the rate, whether it is unreasonable as decided. Such decision, we have said with tiresome repetition, is peculiarly the province of the commission to make, and that its findings are fortified by presumptions of truth, "due to the judgments of a tribunal appointed by law and informed by experience." *Illinois Central Railroad Company v. Interstate Commerce Commission*, 206 U. S. 454, and cases cited. The testimony in this case does not shake the strength of such presumptions. We have seen that the circuit court refrained from expressing an opinion upon anything but the power of the commission. Circuit Judge Baker, dissenting from that view, went further and said:

"The complainants are common carriers whose rates on certain traffic are directed to be reduced by the order complained of. Two grounds for injunction are alleged. One is that the new rates are confiscatory. There is no proof whatever that the rates which the commission prescribed as just and reasonable are not sufficient to pay the cost of handling that traffic, to cover that traffic's full proportion of maintenance and overhead expenses, and to return to the carriers an ample net profit. Furthermore, proof is lacking that, if the carriers should reduce other rates to correct what they claim is the maladjustment caused by the commission's order, the reduction would not leave them abundant net returns. For the purpose of this hearing, therefore, it must stand as an agreed fact that the present reduction is neither directly nor indirectly obnoxious to the charge of taking private property without just compensation."

We concur in these conclusions.

Decree reversed and the case remanded with directions to dismiss the bill and all proceedings in the circuit court.

Justice White dissenting.

The court below enjoined the execution of the order of the commission because it was of the opinion that that body had exceeded the powers conferred upon it by the act to regulate commerce, since it had based its order upon the assumption that it was its duty under the act to secure a relatively equal share of the volume of interstate commerce to communities and places, and therefore that it was its province to alter otherwise legal rates for the purpose of correcting the inequalities which otherwise would arise from the competitive rivalry between sections and places. As, in my opinion, the court below was correct in the view which it took of the order of the commission, and was right in holding that the power which the order manifested was not conferred by law, I dissent from the judgment of reversal now announced. It does not, however, seem to me necessary that I should do more than state the fact of my dissent for the following reasons: The judgment of reversal is based, not upon the ruling that the commission possessed the authority to make the order if it was based upon the assertion of power upon which the court below found the order must necessarily rest, but exclusively upon the theory that the court below, while rightly holding that the commission had not the power which it assumed that body had exerted in making the order, had nevertheless mistakenly enjoined the order because it did not exert, or attempt to exert, the power which the court conceived had been called into play in making it. In other words, although the opinion now announced excludes the authority which the lower court deemed the commission had exerted by the order in question, it nevertheless maintains the order because of the conclusion that the order was but an exertion by the commission of its authority on complaint that a rate was unreasonable of itself, to correct such rate by substituting a reasonable rate therefor. Although I am unable to agree with the reasoning by which the court now gives to the order of the commission the narrow basis thus stated, as the solution of that question depends upon the idiosyncrasies of this particular case and involves no principle of general importance, it seems to me I am called upon to do no more than simply to state my inability to agree.

Justice Holmes and Justice Lurton join in this dissent.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

C. R. Berry, assistant general freight agent of the Chicago Great Western, at St. Joseph, Mo., has been appointed assistant to the vice-president, with office at St. Joseph, Mo.

Joseph H. Young, formerly general superintendent of the Southern Pacific, is now exercising the duties of vice-president and chief operating officer of the Copper River & Northwestern, with headquarters at Seattle, Wash., and it is understood will be elected to the above positions in November.

Operating Officers.

A. B. Apperson has been appointed trainmaster of the Western division of the Chicago Great Western, with office at Clarion, Iowa, succeeding H. W. Hamilton, assigned to other duties.

C. J. Brown has been appointed trainmaster of the south Texas division of the Missouri, Kansas & Texas, with headquarters at Smithville, Tex., succeeding C. E. Stanton, appointed traveling engineer.

P. J. Lynch, assistant superintendent of the Grand Trunk at Allandale, Ont., has been appointed superintendent of the Northern division, with office at Allandale, succeeding W. R. Tiffin, deceased, and the position of assistant superintendent at Allandale has been abolished.

J. H. Jackson, assistant superintendent of the St. Louis & San Francisco, at Springfield, Mo., has been appointed superintendent at Birmingham, Ala., succeeding J. G. Lorton, granted leave of absence on account of his health. C. O. Yoakum succeeds Mr. Jackson.

J. D. McMillan has been appointed trainmaster of the Northern division, Districts 8, 9 and 10 of the Grand Trunk, with office at Lindsay, Ont., succeeding J. Irwin, resigned, and W. J. Piggott has been appointed trainmaster of the Northern division, Districts 11, 12, 13 and 14, with office at Allandale, Ont.

J. J. O'Neill, assistant superintendent of the Chicago, St. Paul, Minneapolis & Omaha, at St. James, Minn., has been transferred to Eau Claire, Wis., succeeding E. E. Nash, who has been appointed private secretary to vice-president of the Chicago & North Western. J. R. Welsh, assistant superintendent at Spooner, Wis., succeeds Mr. O'Neill.

E. C. Manson, superintendent of the Salt Lake division of the Southern Pacific, has been appointed general superintendent of the Oregon Short Line, succeeding J. M. Davis, resigned to accept a position as general superintendent of the Northern district of the Southern Pacific. T. F. Rowlands, assistant superintendent, succeeds Mr. Manson. F. C. Smith, despatcher, succeeds Mr. Rowland.

C. L. Harris, general superintendent of the St. Louis-Louisville lines of the Southern Railway, at St. Louis, Mo., has been appointed general superintendent of the Western district, with office at Birmingham, Ala., succeeding W. R. Hudson, resigned to go to the Norfolk Southern. B. G. Fallis, superintendent of the Charlotte division at Greenville, S. C., succeeds Mr. Harris, with office at St. Louis, Mo.

Alva C. Elston, superintendent of the New York division of the Erie Railroad and branches, and of the New Jersey & New York, at Jersey City, N. J., has been appointed superintendent of the Buffalo division and branches of the Erie Railroad, and manager of the Union Steamboat Line, with office at Buffalo, N. Y., succeeding Charles A. Brunn, assigned to other duties. Robert S. Parsons, superintendent of the Susquehanna division and branches, at Hornell, N. Y., succeeds Mr. Elston, with office at Jersey City, and Clarence D. Taylor, trainmaster at Hornell, succeeds Mr. Parsons.

R. M. Leech, superintendent of the Mexico and Queretaro divisions of the National Railways of Mexico, at City of Mexico, Mex., has been appointed general superintendent of transportation of all divisions of the system north of Gonzalez Junction and San Juan del Rio, and R. E. Comfort, general superintendent of the narrow-gage lines at City of Mexico, has been appointed general superintendent of transportation in charge of the Mexico and Queretaro divisions of the standard-gage lines and all divisions of the narrow-gage lines of the system. These officers will be in full charge of all transportation matters, and both will have offices at Colonia station, City of Mexico. W. H. Schmeiding, superintendent of car service at City of Mexico, has been appointed superintendent of transportation, in charge of all matters pertaining to the movement and distribution of passenger and freight equipment, tonnage, demurrage, switching and car service matters in general, and in addition thereto will perform such other duties as may from time to time be assigned to him by the general superintendents of transportation.

Traffic Officers.

R. D. Williams has been appointed district passenger agent of the Union Pacific, with headquarters at Denver, Colo.

Theodore Davis has been appointed an agent of the Erie Despatch, with office at Columbus, Ohio, succeeding W. R. Sibley, resigned.

F. L. Norman has been appointed commercial agent of the Grand Trunk at Seattle Wash., succeeding L. V. Bruce, transferred to Vancouver, Wash.

C. V. Link has been appointed a general agent of the Southern Indiana, representing the traffic and transportation departments, with office at Bedford, Ind.

The Steel-Hardin-Dillon Co. has been appointed export and import agents of the Rock Island Lines, with headquarters at New Orleans, La., succeeding J. H. W. Steel & Co.

The Erie Despatch agency at Saginaw, Mich., has been abolished, and the territory heretofore covered by that agency will be under the jurisdiction of the agent at Detroit.

G. A. Smith has been appointed division freight and passenger agent of the Eastern division of the Chicago Great Western, with office at Chicago, Ill., succeeding R. W. Goodell, promoted.

G. C. White has been appointed industrial agent of the West Coast Route, which includes the Sonora Railway and the Southern Pacific Railroad of Mexico, with headquarters at Guaymas, Mex.

P. A. Sullivan, traveling freight agent of the International & Great Northern, at San Antonio, Tex., has been appointed a commercial agent, with office at San Antonio, succeeding G. E. Marshall, resigned to go into other business.

W. F. Wilson has been appointed a commercial agent of the Southern Railway, and W. T. Turner has been appointed a soliciting agent, succeeding M. R. Yates, resigned to go into other business, both with offices at Richmond, Va.

James E. Roach, whose resignation as traveling freight agent of the Central of Georgia at Jacksonville, Fla., has been announced in these columns, has been appointed commercial agent of the Clyde Steamship Co. and the Mallory Steamship Co., with headquarters at Tampa, Fla., succeeding L. S. Scroble, transferred.

R. W. Goodell has been appointed general agent, freight department, of the Chicago Great Western, with office at Minneapolis, Minn., succeeding R. H. Heard, whose resignation has already been announced in these columns. George O. Somers has been appointed a general freight agent, with office at Chicago, succeeding W. E. Pinckney, resigned, and Robert J. Sefton has been appointed a traveling passenger agent at Seattle, Wash., succeeding George P. Guyot, resigned.

Guy S. McCabe, general western and division freight agent, has been appointed general western freight agent and division freight agent of the Chicago Terminal Division of the Pennsylvania Co., with office at Chicago, succeeding William Borner, appointed assistant to the freight traffic manager of the Pennsylvania Lines West, with office at Chicago. James E. Weller, division freight agent of the Pittsburgh, Cincinnati, Chicago & St. Louis, at Pittsburgh, Pa., succeeds Mr. McCabe.

Engineering and Rolling Stock Officers.

George S. Goodwin has been appointed assistant mechanical engineer of the Rock Island Lines, with office at Silvis, Ill.

R. H. Howard, engineer maintenance of way of the Chicago & Eastern Illinois, with office at Chicago, has resigned. L. C. Hartley, signal engineer, succeeds Mr. Howard.

P. A. Rainey has been appointed assistant supervisor of signals on the Eastern Pennsylvania division of the Pennsylvania Railroad, with office at Harrisburg, Pa., succeeding F. J. Bauman.

Ben Johnson, assistant locomotive superintendent of the United Railways of Havana, at Havana, Cuba, has been appointed superintendent of motive power of that company and the Havana Central, with office at Havana, succeeding Charles J. Thornton, resigned. A sketch of Mr. Johnson's railway life was published in our issue of December 31, 1909, page 1319.

E. J. Searles has been appointed assistant to J. D. Harris, general superintendent of motive power of the Baltimore & Ohio, with office at Baltimore, Md. Mr. Searles is a mechanical engineer and a graduate of John Hopkins University. He served as a mechanical apprentice in the shops of the Pennsylvania Railroad in 1896, and from 1902 to 1904 was engineer of motive power of the Baltimore & Ohio at Pittsburgh. Since 1904 he has been engaged in the railway supply business.

Purchasing Officers.

T. Duff Smith has been appointed fuel agent of the Grand Trunk Pacific, with office at Winnipeg, Man.

OBITUARY.

Charles E. Doyle, vice-president and general manager of the Chesapeake & Ohio, died June 5. Mr. Doyle was born on May 29, 1851, in Missouri, and was appointed superintendent of the Cairo, Vincennes & Chicago, now a part of the Cleveland, Cincinnati, Chicago & St. Louis, in February, 1888. In May of the following year he was appointed a superintendent of the Pittsburgh & Western, now a part of the Baltimore & Ohio, remaining in that position for about one year. In February, 1890, he went to the Chesapeake & Ohio and for the next seven years he was superintendent of the Peninsula, Richmond, Washington and James River divisions of the Chesapeake & Ohio, at Richmond. On January 1, 1897, he was made general superintendent of the Eastern division. He was appointed general manager in January, 1901, and in July of last year was elected also vice-president.

Joseph S. Harris, formerly president of the Lehigh Coal & Navigation Co., and later president of the Reading Company, died June 2, at his home in Germantown, Pa. Mr. Harris was born in Chester county, Pa., April 29, 1836. He began railway work in April, 1853, as a rodman and topographer on the North Pennsylvania, now a part of the Philadelphia & Reading. About a year later he entered the service of the United States as an officer of the coast survey. In 1856 he was detached on duty with the Kentucky Geological Survey to trace and mark a parallel of latitude in Kentucky, and from March of the following year to April, 1864, was assistant astronomer of the northwest boundary survey; and while in this service he was also from February to September, 1862, the first officer of and later was in command of the United States steamer Sachem, attached to Farragut's Mississippi River squadron. From April, 1864, to April, 1868, he was a civil and mining engineer in private practice at Pottsville, during which time he was also engineer of the Lehigh & Mahanoy Railroad. From April, 1868, until the fall of 1870 he was chief engineer of the Morris & Essex Railroad. In 1870 he entered the service of the Philadelphia & Reading Coal & Iron Co., and later that of the Lehigh Coal & Navigation Co. In 1880 he was made general manager of the Central Railroad of New Jersey, and held that position about two years. From March, 1882, to May, 1893, he was president of the Lehigh Coal & Navigation Co. In the fall of 1886 he was made receiver and afterward vice-president of the Central of New Jersey, and in 1892 was also vice-president of the Philadelphia & Reading Railroad and the Philadelphia & Reading Coal & Iron Co. From May, 1893, to November 30, 1896, he was receiver and president of the Philadelphia & Reading, and from December 1, 1896, until his retirement, in 1901, he was president of the reorganized road, the Reading Company, the Philadelphia & Reading Railway and the Philadelphia & Reading Coal & Iron Company. He leaves four children.

Railway Construction.

New Incorporations, Surveys, Etc.

Alabama Roads.—Application has been made for a charter to build a line from Decatur, Ala., southwest to Falls City, about 50 miles. The company has offices at New Decatur. E. H. Allison, president, and D. W. Day, vice-president.

Alaska Northern.—Contracts, it is said, are to be let soon for the construction of 170 miles from the present terminus in Alaska to the Matanuska coal fields and to a point on the Susitna river in the direction of the Iditarod gold fields. An officer is quoted as saying that the cost of the extension will be $7,000,000. The line will follow an old survey to mile 146, from which point a line will run to the Matanuska coal fields, 38 miles, and another line will run towards Iditarod. O. G. Labree, president, Spokane, Wash. (Nov. 12, p. 942.)

Algoma Central & Hudson Bay.—An officer writes that contracts have been given to the O'Boyle Brothers Construction Co., Ltd., Sault Ste. Marie, Ont., for work on an extension from Hawk Lake Junction, Ont., north to Hobon, on the Canadian Pacific, 31 miles. The work will be difficult. Maximum grades will be 0.6 per cent. and maximum curvature 12 degs. The work includes 17 trestles; a roundhouse will also be built at Hobon. (June 3, p. 1390.)

American Central.—An officer of the Central Construction Co., of Mobeetie, Tex., writes that surveys have not yet been finished on the section from Miami, Tex., via Mobeetie, Wheeler, Texola, Okla., Mangum and Olustee, to Vernon, Tex., 160 miles. It is expected that contracts will be let in September or October of this year to build the line. There will be two heavy bridges. W. E. McClintock, chief engineer, Mobeetie. (March 25, p. 849.)

Argentine Central.—See Montezuma & Western.

Argentine Tunnel.—See Montezuma & Western.

Canadian Northern.—According to press reports, this company is asking for bids to build about 60 miles of line in British Columbia from Port Mann, which is opposite New Westminster, east along the south bank of Fraser river. (April 29, p. 1113.)

Canadian Northern Quebec.—According to press reports, this company is planning to carry out work this summer on a new line from Hawkesbury, Ont., east to Montreal, to provide direct service with Ottawa. Bids are now being asked for the work. From Hawkesbury the line will cross the Ottawa river and run through Carillon, Que., St. Andrews and St. Eustache to Hochelaga and Montreal. The route and location maps have been approved by the railway commission. The Dominion Parliament has voted subsidies in aid of the construction of this line, not exceeding 65 miles, as well as a line from Arundel to a point in the united townships of Preston and Hartwell, Que., not exceeding 30 miles. An officer is quoted as saying that the company has under consideration the question of providing big terminals in Montreal, but plans are not sufficiently advanced to give any particulars.

Canadian Pacific.—A contract is said to have been given to Savin & Stevens, Victoria, B. C., for building a section of 20 miles on the Esquimalt & Nanaimo. (Nov. 12, p. 943.)

Chicago & North Western.—This company is said to have filed plats with the State Land Department of South Dakota for the line projected over a year ago, to be built from Dallas, Gregory county, S. Dak., west to Mellette county.

Chicago, Milwaukee & St. Paul.—This company has given contracts for the last stretches of double track between Chicago and St. Paul to be completed this summer, making the St. Paul the first double track line between Chicago and Minneapolis and St. Paul. (April 15, p. 1015.)

Copper River & Northwestern.—According to reports the first train was recently run over the new cantilever bridge at the Miles Glacier, Alaska, over the Copper river, establishing train service to Mile 104. About 28 miles of track remains to be laid to complete the line to the mouth of the Chitina river, where the government is building a trail

to the Valdez-Fairbanks trail. It is believed that the completion of the road to the mouth of the Chitina will shorten the journey to Fairbanks by four or five days. (Dec. 17, p. 1213.)

DELAWARE, LACKAWANNA & WESTERN.—Representatives of this company and officials of the city of Bloomfield, N. J., have reached a tentative agreement for improvements to be made on this road from Bloomfield to Montclair, which it is understood include a double-track elevated line between these two places. No action will be taken until the plans are approved by the city council as well as the railway officials.

ESQUIMALT & NANAIMO.—See Canadian Pacific.

FERNWOOD & GULF.—An officer writes that this company recently completed an extension of six miles from Tylertown, Miss., east, and the line is now in operation from Fernwood east to Knoxo, 27 miles. An additional five miles will be finished by July 1, which carries the line to a point nine miles west of Columbia. It is probable that a further extension will be built to Columbia. The line traverses a timber section, passing numerous lumber mills, also several large turpentine stills.

FOREST CITY, FERTILE & MASON CITY.—Incorporated in South Dakota, with $400,000 capital, and offices at Watertown, S. Dak., and at Forest City, Iowa. The company was organized to built from Forest City, Iowa, east through the counties of Winnebago, Hancock, Worth and Cerro Gordo, to Fertile, thence southeasterly to Mason City, 40 miles. The incorporators include: P. O. Koto, C. N. Christopherson, C. S. Isaacs, Forest City; A. M. Sheimo, Baldwin, Wis.; A. L. Sheirn and M. J. Hawley, Watertown, S. Dak.

GAINESVILLE, OKLAHOMA & WESTERN.—According to reports this company is ready to let contracts for work on 20 miles of line. Location survey has been made for 12 miles. The company was organized to build from Gainesville, Tex., southwest via Era and Greenwood to Bridgeport, 56 miles. J. Whaley, president; F. B. Truax, chief engineer, Gainesville. (May 20, p. 1281.)

GILMANTON RAILWAY.—Permission has been granted the Wisconsin Construction Co. to build a line from Gilmanton, Wis., through the Waumandee valley.

GREAT NORTHERN.—An officer writes that it is expected to have track laid on the branch from Stanley, N. Dak., northwest to Montrose, about 50 miles, by August. Most of the grading has been finished. Morris & Shepard are the contractors. (April 8, p. 970.)

HORSE CAVE & EASTERN.—Incorporation will be asked for by a company under this name, in Kentucky, to build from Horse Cave, Ky., on the Louisville & Nashville, southeast via Hiseville and Knob Lick to Edmonton, 25 miles. The line is eventually to be extended southeast to Burkesville, on the Cumberland river, an additional 25 miles, at the edge of a coal and timber district. The company proposes to use gasolene or gas-electric motor cars for passenger and mail service, and steam will be used as the motive power for handling freight. Location surveys will be made in July. Louis Edwards, 1463 Arlington avenue, St. Louis, Mo., is the promoter.

INTERNATIONAL & GREAT SOUTHERN.—A charter has been granted in Oklahoma to the Hines-Chicago Construction Co., Oklahoma City, Okla., with $50,000 capital, to build a line for this company, which was chartered several years ago. The projected route is from Oklahoma City, northwest to Trinidad, Colo. The company has filed a mortgage for $3,500,000, covering the right-of-way and other property. The incorporators include: P. A. Hines, F. Karasec, Chicago, and S. C. Glasgow, Oklahoma City.

MEMPHIS, DALLAS & GULF.—This company, it is said, has taken over the rights and property of the Ultima Thule, Arkadelphia & Mississippi, operating a 22-mile line from Daleville, Ark., to Sparkman, also the Antoine Valley Railroad, and will use these lines to form part of its proposed line from Memphis, Tenn., southwest to Dallas, Tex. (See Memphis, Paris & Gulf, April 8, p. 970.)

MISSOURI PACIFIC.—An officer writes that a contract was given on May 28 to the Walsh Construction Co., Davenport, Iowa, for double-tracking work on the Arkansas division from McAlmont, Ark., to Bald Knob. A contract for grading in connection with second-track work on the Missouri and Arkansas divisions between Poplar Bluff, Mo., and Harvieli and Diaz, Ark., and White River, has been let to Ball & Peters, Little Rock. A contract for the trestle bridging required in connection with the above grading work has been let to Burke & Joseph, Cape Girardeau, Mo. (See St. Louis, Iron Mountain & Southern, June 3, p. 1391.)

MONTEZUMA & WESTERN.—Under this name a company is said to have been formed by Denver capitalists and has secured control of the Argentine Tunnel Railway Co. and the transcontinental tunnel, which was planned to connect Clear Creek, Colo., with Summit county. It is said that the new owners will complete the tunnel at once, and then build from Denver, Colo., southwest to Leadville, about 100 miles. It is understood that the company has secured control also of the Argentine Central, operating a 16-mile line in Colorado, from Silver Plume to the summit of Mount McClellan, and will operate that road in connection with an extension to Grays Peak.

MOUNT ADAMS.—Survey is said to be made for the first 20 miles of this line and contracts are to be let for the work about July 20. The company was organized to build from White Salmon, Wash., north to Glenwood, about 40 miles. R. Lauterbach, president, White Salmon.

NEBRASKA & DAKOTA.—Incorporation has been asked for in South Dakota by this company, with a capital of $4,500,000 and headquarters at Pierre, S. Dak., and a business office in Chicago. The plans call for a line from Murdo, S. Dak., south via the counties of Lyman, Mellette, Todd and Tripp, in South Dakota, and Keyapaha, Rock, Loup and Garfield, in Nebraska, to Burwell, 180 miles. The incorporators include: A. Martin, P. Miller, S. C. Ware, B. McWilliams and C. J. Ruebling, all of Chicago, and L. L. Stephens, Pierre.

NEW YORK, NEW HAVEN & HARTFORD.—The New York Public Service Commission, Second district, has consented to the abandonment by the New York, Westchester & Boston of that portion of its route which is northerly and westerly of White Plains in Westchester county, N. Y., between that place and Hall's Corners, now Elmsford. (April 29, p. 1114.)

The New York Public Service Commission, Second district, has issued an order that there shall be no grade crossings on the New York, Westchester & Boston main line from the boundary line between the city of New York and the county of Westchester to the city of New Rochelle, and on the branch line from the city of Mount Vernon to White Plains. The order specifies the type of bridge or subway which shall be constructed at each crossing, of which there are 44 in the city of Mount Vernon, village of North Pelham, city of New Rochelle and town of Eastchester, Scarsdale and the village of White Plains.

NEW YORK, WESTCHESTER & BOSTON.—See New York, New Haven & Hartford.

OKLAHOMA-KANSAS.—Organized in Kansas to build from Galena, Kan., northwest via Riverton to Columbus, also from Riverton south via Baxter to Miami, Okla. As soon as the survey is finished arrangements will be made to finance the proposition and build the line. Dr. C. M. Jones, T. F. Cole, E. B. Morgan, J. M. Cooper, Baxter Springs; J. S. Shomon, Galena, and Dr. W. L. McWilliams, Miami, are interested.

OREGON RAILROAD & NAVIGATION CO.—It is said that this company will resume operations in the Clearwater Valley, Idaho, and that this coming summer extensive improvements will be carried out by the Harriman system in Idaho and Oregon, simultaneously. The work includes building the extension from Joseph 12 miles east to Lewiston, the junction of the Northern Pacific and the Camas Prairie, over which the O. R. R. & N. Co. has joint trackage rights, into the white pine belt along the north and middle forks of the Clearwater. The line has been surveyed and right of way secured.

OREGON TRUNK RAILWAY.—According to press reports, H. C. Henry, Seattle, Wash., who has the contract for an extension of this line, has sublet the work to Nelson Brothers, to build the 126 miles from Madras, Ore., south to the north end of the Klamath-Indian reservation. (May 20, p. 1282.)

PACIFIC & IDAHO NORTHERN.—According to press reports, work is to be started at once on an extension of this road from the present terminus at Evergreen, Idaho, northeast to Meadows, 17 miles. It is expected to have trains in operation over this extension during 1910. (Dec. 3, p. 1108.)

PRAIRIE FARM & SOUTHWESTERN.—Construction work has been started on this line, projected from Prairie Farm, Wis., southwest to Emerald, 16 miles. Grading has been finished as far as Bushey lake. G. E. Scott, president, Prairie Farm. (May 20, p. 1282.)

QUINCY WESTERN.—An officer writes that this road will be put in operation on June 15 for both freight and passenger traffic between Hartwell, Cal., on the Western Pacific, and Quincy, in Plumas county, about seven miles. (Oct. 29, p. 828.)

RAPID CITY, BLACK HILLS & WESTERN.—This company, operating a line from Rapid City, S. Dak., west to Mystic, 34 miles, is said to have announced that it will build an extension this year west into the coal fields of Wyoming.

ROCK ISLAND, TEXICO-FARWELL & GULF.—An officer writes that arrangements for the construction of the line projected under the name of the Tucumcari, Portales & Gulf have been made, and the construction work is to be started at once. The projected route is from Tucumcari, N. Mex., southeast to the Gulf of Mexico. The first work to be carried out will be on a section of 57 miles from Texico-Farwell. Contracts for grading and track laying on 50 miles have been let on the section north of Pyoti, Tex., and an additional 50 miles will be let for the section south of Pyoti, through the irrigated belt to Fort Stockton. Heavy subsidies in land grants and cash have been given to the company. Complete surveys and reports have been made from Texico to the Rio Grande, as well as to Faulkner, Mex., a total of about 570 miles. Address M. J. Healy, Texico, N. Mex. (See Tucumcari, Portales & Gulf, April 15, p. 1017.)

SAN LUIS SOUTHERN.—An officer writes that this company has track laid on 20 miles and work under way on an additional 20 miles from the Denver & Rio Grande connection at Blanca, Colo., south to a point in Costilla county. The work will be light, being mostly prairie construction. Maximum grades will be 0.8 per cent. and maximum curvature 4 degs. F. E. Brooks, president, Colorado Springs; L. D. Blauvelt, chief engineer, Blanca.

SEABOARD AIR LINE.—This company opened an extension of its Dunnellon branch on June 4. The branch runs from Early Bird, Fla., southward, and includes Camp's Phosphate Railroad, which has been bought by the Seaboard Air Line. The new extension is from Anderson Mine via Dunnellon and River Mine, to section 20-C Mine, 20.54 miles from Early Bird.

TEMISKAMING & NORTHERN ONTARIO.—An officer writes that contracts were to be let on June 7 for building an extension from the present southern terminus at North Bay, Ont., east to a connection with the northern terminus of the Grand Trunk at Nipissing Junction, three miles. (April 22, p. 1066.)

TUCUMCARI, PORTALES & GULF.—See Rock Island, Texico-Farwell & Gulf.

ULTIMA THULE, ARKADELPHIA & MISSISSIPPI.—See Memphis, Dallas & Gulf.

WESTERN MARYLAND.—A contract is said to have been given to the Conestogo Construction Co., Pittsburgh, Pa., for building a section of 10 miles on the extension from Cumberland, Md., north to Connellsville, Pa. Sub-contracts are said to have been given by the Carter Construction Co., Pittsburgh, Pa., to Foley Brothers & Co., for work on a heavy section between Markleton and Ohio Pyle, six miles, and to Connolly & Wood for the masonry work from Cumberland, north to the Pennsylvania state line. (May 13, p. 1237.)

WISCONSIN ROADS.—Incorporation has been asked for by a company at Madison, Wis., to build from Fennimore to Bagley, 29 miles. The incorporators include: J. F. Morse, W. E. Lewis, F. Alexander, G. Monroe, F. Kolb, A. Kooley and W. Leighton.

Railway Financial News.

BUFFALO & SUSQUEHANNA RAILROAD.—Edward B. Smith has been chosen a member of the first refunding 4 per cent. mortgage bondholders' protective committee, succeeding Asa S. Wing, resigned.

CENTRAL NEW ENGLAND.—Joseph Moore, Jr., representing minority stockholders, has received a reply to his letter to President Mellen, of the New York, New Haven & Hartford, in which President Mellen says that he will discuss negotiations for the purchase by the New Haven of the minority stock of the Central New England, but he "should not be willing, as at present advised, to pay anything like the price you name in your letter" ($50 for the preferred and $25 for the common).

A contract has been made with the Poughkeepsie City & Wappingers Falls Railway by which that company will run electric cars for passengers over the Hospital branch of the C. N. E. between the main line and the Hudson River State Hospital and between the hospital and the junction with the New York Central.

HOCKING VALLEY.—The court order prohibiting the Hocking Valley from retiring $15,000,000 preferred stock has been dissolved, but the restraining order prohibiting the Hocking Valley, the Chesapeake & Ohio and the Lake Shore & Michigan Southern from voting stock of the Kanawha & Michigan has been continued for 10 days for final hearing on request of the plaintiffs.

METROPOLITAN STREET RAILWAY (NEW YORK).—This property has again been ordered sold on July 1 under foreclosure of the general mortgage and the collateral trust mortgage. At the time formerly appointed for the sale under the collateral trust mortgage alone no bids were received.

MICHIGAN CENTRAL.—The company is now engaged in making arrangements for the sale to French bankers of $17,500,000 4 per cent. debenture bonds of 1909-1929. This is the unsold portion of an authorized issue of $25,000,000 and the proceeds will be used in part, it is understood, to reimburse the New York Central & Hudson River for advances necessary to retire $10,000,000 Michigan Central notes which matured and were paid off on February 1, 1910.

NEW YORK, NEW HAVEN & HARTFORD.—See Central New England.

The Massachusetts Lower House has passed by a vote of 137 to 76 a bill permitting the New Haven to buy and operate the Berkshire Street Railway. The bill has already passed the Massachusetts Senate.

ROSCOE, SNYDER & PACIFIC.—See Texas & Pacific.

SOUTHERN INDIANA.—The federal court at Indianapolis has ordered the sale of the property of the Southern Indiana under foreclosure of the general mortgage of 1906, under which $3,212,000 bonds are outstanding. A similar order was made by Judge Kohlsaat at Chicago on June 2 at the same time that he ordered the sale of the Chicago Southern under foreclosure of the first mortgage. The amount due, including interest, under the mortgage of the Southern Indiana is $3,547,115 and the road is sold subject to the first 4 per cent. mortgage of 1901, under which there is due $7,537,000, with interest from February 1, 1909, and to the unpaid purchase price of equipment due to the Barney & Smith Car Co. amounting to $349,106, and to the American Locomotive Co. amounting to $48,437. There are outstanding $382,000 6 per cent. receiver's certificates, due November 1, 1910.

SOUTHERN PACIFIC.—Kuhn, Loeb & Co., New York, have made arrangements for the sale in Germany of $25,000,000 bonds of the Southern Pacific.

TEXAS & PACIFIC.—This company has loaned $157,511 to the Roscoe, Snyder & Pacific, and the loan is secured, it is understood, by a first mortgage note. The Texas Railroad Commission has already authorized the Roscoe, Snyder & Pacific to issue $261,500 bonds secured on 50 miles of road in addition to the first mortgage note given to the Texas & Pacific.

Supply Trade Section.

The Standard Railway Equipment Company, St. Louis, Mo., has moved its general office to the Frick building, Pittsburgh, Pa.

J. L. Connors has been appointed sales manager of the Ralston Steel Car Co., with headquarters at Columbus, Ohio, in charge of all sales of the company.

The Duplex uncoupler and automatic release, manufactured by the National Railway Devices Co., Chicago, will be used on the 1,000 New York Central automobile cars to be built by the Merchants Despatch Transportation Co., Rochester, N. Y.

A. D. McAdam, who was recently elected vice-president of the St. Louis Surfacer & Paint Company, St. Louis, Mo., and western sales-manager of the Ohio Malleable Iron Company, Columbus, Ohio, will have his office at 1101 Fisher building, Chicago, after July 1, 1910.

The Westinghouse Electric Co. has sold to Kuhn, Loeb & Co. an issue of $4,000,000 three-year 6 per cent. notes to refund an issue of $6,000,000 6 per cent. notes coming due in August. The new notes are being offered for subscription at par. The balance of the maturing issue is to be paid off in cash set aside at the time of reorganization, and this will call for slightly more than $2,000,000.

A. Beamer, who recently resigned as superintendent of the Idaho division of the Northern Pacific, is now president of the A. B. C. Train Operating Co., Chicago, and is devoting his entire time to the advancement and introduction of the A. B. C. system of train operation of which he is the patentee and which has been in operation on the main line of the Northern Pacific, west of Paradise, Mont., for the past three years.

The Isthmian Canal Commission will receive bids until June 21 for air-brake hose, rubber belting, packing, gaskets, copper tubing, bolts, rail benders, saws, diaphragm pumps, water gages, hose couplings, flue cleaners, plate glass and other supplies (Circular No. 588), and until June 20 for lumber, manganese sheels for revolving screens for rock crushing plant, steel castings, firebox steel, crucibles and hose couplings (Circular 587); and until June 23 for steel castings—repair parts for steam shovels (Circular No. 586).

The armature shifting type of variable speed motor, known as the Lincoln variable speed motor, and manufactured by the Reliance Electric & Engineering Company, Cleveland, Ohio, will hereafter be known as the Reliance adjustable speed motor. The change is made necessary to better describe this type of motor in accordance with present standard terms adopted by the American Association of Electric Motor Manufacturers, and also to avoid confusion with the Lincoln Electric Company, also of Cleveland.

Geo. E. Pratt has been elected vice-president in charge of sales of the Crawford Locomotive & Car Co., Streator, Ill., with headquarters at Streator. Mr. Pratt started as a machinist apprentice in the Taunton Locomotive Works, Taunton, Mass. He served in a number of clerical positions on eastern railways, was in charge of finances and details in the building of the Chautauqua Lake Railway, Jamestown, N. Y., and served 13 years as contracting agent of industrial and car manufacturing concerns. He is a member of several railway clubs and was the first secretary and treasurer of the New England Club.

The executive committee of the Signal Appliance Association, at a meeting on April 19, voted that it would not be wise to make exhibits at the October meeting of the Railway Signal Association at Atlantic City, space in the hotels being unavailable and the cost of space in other places being found to be from 25 cents to 28 cents a square foot. On request from signalmen and others this action was reconsidered on May 23, but the decision was substantially reaffirmed. That is to say, the Appliance Association will take no action in regard to exhibits. This, of course, will not prevent individuals from exhibiting in their rooms, in the hotels or elsewhere. Neither does the present action in any way affect the social and entertainment features of the convention.

W. P. Bettendorf, president of the Bettendorf Axle Co., Bettendorf, Iowa, died at his home in Bettendorf, Friday, June 3, after an operation for peritonitis. The funeral services were held Monday, June 6. Mr. Bettendorf was born in Mendota, Ill., July 1, 1857. He was the eldest of four children. J. W. Bettendorf, the only one of the children now living, worked with his brother in developing the Bettendorf interests. Mr. Bettendorf accompanied his parents when they moved from Illinois to Missouri and later to Kansas, where he attended the St. Mary's Mission school. In 1874 he became a machinist apprentice with the Peru Plow Co., serving the full term. As a result of his interest in agricultural implements he invented the first power lift sulky plow in 1878. He later developed a metal wheel and the machinery necessary for its manufacture. He granted a shop right to the Peru Plow Co. for making this wheel, but as this branch of the business grew, the name of the company was changed to the Peru Plow & Wheel Co. In 1886 Mr. Bettendorf and his brother, J. W., took over the manufacture of the Bettendorf wheel in a plant at Davenport, Iowa. In 1889 the Bettendorf Metal Wheel Co. was incorporated, with which he was connected until 1892, when he developed a steel gear for farm wagons. After three years of experimental work he built the machinery necessary for making steel gears. This machinery was sold to the International Harvester Co. in 1905, but the Davenport company still manufactures the gears under contract. In addition to this business the company manufactured steel car trucks, steel underframes for cars and complete cars. The Bettendorf Axle Co. was organized and incorporated January 1, 1895, with W. P. Bettendorf as president and his brother, J. W., as secretary. After sustaining very severe fire losses at the plant in Davenport, Iowa, a new plant was established about three miles east of the city at the town of Gilbert, now Bettendorf. This plant now employs 800 men and has recently been enlarged by the addition of a foundry and erection shop.

W. P. Bettendorf.

TRADE PUBLICATIONS.

Gas Analysis Instruments.—The Carb-Ox Co., Chicago, has issued a 16-page booklet describing its gas analysis instruments and allied specialties. The instruments made by this company are all portable and while they may be used as laboratory instruments are particularly designed for practical work.

Electric Fixtures.—The Safety Car Heating & Lighting Co., New York, has just issued a very handsome catalogue, printed on heavy glazed paper, containing illustrations and descriptions of the electric car lighting fixtures which it manufactures. The aim has been to accurately show the design of the fixtures and to present a comprehensive collection from the great variety of designs made by this company. The designs shown represent all the principal schools of art, and this method of presentation should be helpful in meeting the

requirements of various classes of cars, and especially in those cases where quick delivery is essential. Special attention has been given to the photometric tests. The designs are worked out to insure a maximum interchangeability of parts.

Hardware.—The Russell & Erwin Manufacturing Co., New York, has issued Vol. 10 of its general catalogue covering the very extensive line of builders' hardware which it manufactures. This company's car door hardware, padlocks and switchlocks are particularly adapted for railway use. The catalogue contains over 1,200 pages, 10½ in. x 12 in., of heavy glazed paper, made up in loose leaf form. An admirable system of numbering the pieces and indexing them permits of easy and rapid location of any item.

About one-quarter of the catalogue is devoted to door hardware designed to harmonize with the interior decorations of the different periods and styles of architecture, such as: Elizabethan, English Renaissance, Georgian, Gothic, Greek, Louis XIV., Roman, Romanesque, etc. Each period is given as a separate unit and prefaced with an explanation of its tendencies in architecture and interior decoration. Besides this building hardware, designed to harmonize more directly with the interior decoration, an extensive line of plain hardware, appropriate for buildings and cars of all classes, is shown. The last section of the catalogue covers cabinet and trunk locks, miscellaneous hardware and mechanic's tools.

RAILWAY STRUCTURES.

Bloomington, Ill.—The citizens have accepted the offer of the Chicago & Alton to build a new roundhouse and passenger station if the city would furnish land at a cost of $165,000. It is reported that the roundhouse will contain 44 stalls and that the new station will cost $75,000.

Goldfield, Nev.—According to press reports, work is now under way by the Tonopah & Goldfield putting up shops, a roundhouse and office building at Goldfield. (Feb. 11, p. 332.)

Hobon, Ont.—See Algoma Central & Hudson Bay under Railway Construction.

Marshall, Ind.—The Cincinnati, Hamilton & Dayton passenger station was burned June 3.

Montreal, Que.—See Canadian Northern Quebec under Railway Construction.

Mt. Olive, Ill.—The Wabash plans to build a 300-ton coaling station.

New Westminster, B. C.—According to press reports, the Canadian Pacific will make improvements to its New Westminster station. The work includes a 25-ft. addition to both ends of the station, for which contract has already been let. The cost of the improvements will be about $15,000.

Omaha, Neb.—The Chicago, Burlington & Quincy has prepared plans for a new freight house to consist of two buildings 64 ft. wide; one for inbound, the other for outbound freight. The buildings will be over 900 ft. long ultimately, although only a portion of this length is to be built now. The construction is of brick with steel truss roof, wooden floor, foundations on concrete piers, a portion of which are supported on piles. Four tracks are laid between the two buildings. (July 23, 1909.)

San Bernardino, Cal.—The Atchison, Topeka & Santa Fe expects to begin work in a short time on a new machine shop.

Saspamco, Tex.—The San Antonio & Aransas Pass is building new passenger stations at Saspamco and Tuleta.

Tennyson, Tex.—According to press reports, the Kansas City, Mexico & Orient will start work soon on a stone passenger station at Tennyson.

Tuleta, Tex.—See Saspamco, Tex.

Van Buren, Me.—A new bridge is to be built at once over the St. Johns river, to cost $75,000. It will probably be a combined highway and railway bridge.

Late News.

The items in this column were received after the classified departments were closed.

H. H. Westinghouse has been elected president of Westinghouse, Church, Kerr & Co., Ltd., succeeding the late W. C. Kerr.

R. S. McCormick has been appointed chief engineer of the Algoma Central & Hudson Bay and the Manitoulin & North Shore, with office at Sault Ste. Marie, Ont.

Frank L. Sheppard, general superintendent of the New Jersey division of the Pennsylvania Railroad, at Jersey City, N. J., has been appointed general superintendent of the Pennsylvania Tunnel & Terminal Railroad Co.

L. S. Bourne has been appointed superintendent of the Tennessee Central, succeeding W. H. Fox, resigned, and P. B. Smith has been appointed trainmaster. W. L. Wene has been appointed purchasing agent, succeeding E. A. Mann, resigned, all with offices at Nashville, Tenn.

W. C. Hurst has been appointed superintendent of the Northern and Southern divisions of the Cincinnati, Hamilton & Dayton, with office at Dayton, Ohio, succeeding J. M. Scott, resigned, and C. L. Brevoort, trainmaster at Cincinnati, Ohio, has been appointed superintendent of terminals, succeeding M. J. Griffin, resigned. Mr. Brevoort's jurisdiction will extend from Cincinnati to New River Junction, and he will report to the superintendent at Dayton.

The area sown to spring wheat is about 19,742,000 acres, or 1,349,000 acres (7.3 per cent.) more than sown last year. The condition of spring wheat on June 1 was 92.8 as compared with 95.2 on June 1, 1909; 95.0 on June 1, 1908, and 93.0 the June 1 average of the past ten years. The condition of winter wheat on June 1 was 80.0, as compared with 82.1 on May 1, 1910; 80.7 on June 1, 1909; 86.0 on June 1, 1908, and 81.9 the June 1 average of the past ten years. The condition of rye on June 1 was 90.6, against 91.3 on May 1, 1910; 89.6 on June 1, 1909; 91.3 on June 1, 1908, and 89.9 the June 1 average of the past ten years.

The general executive committee of the Railway Business Association held a meeting at the Hotel Belmont, New York City, on Wednesday afternoon, at which A. M. Kittredge, president of the Barney & Smith Car Co., Dayton, Ohio, was elected a vice-president, and S. P. Bush, president of the Buckeye Steel Castings Co., Columbus, Ohio, was appointed an executive member. An appeal was made to Congress, the railways and the shippers, asking that each of these interested classes do everything that is possible to clear the way for an early decision by the Interstate Commerce Commission on the question of higher freight rates. In its appeal to Congress the commission urges immediate action on the railway bill and recommends that the provision giving power to the Interstate Commerce Commission to pass on the reasonableness of increased freight rates be enacted to go into effect on its passage. The railways are asked to facilitate the work of the commission by so arranging their schedules and having their reasons therefor so clearly presented that the commission will not have to ask for explanations. A demand is also made that the railways explain more fully to shippers their reasons for increased rates. In its appeal to shippers the committee urges that they look on the railways as on any other business concern, for whose solvency the management is responsible and not the government. The committee says: It has been said recently in the heat of controversy that in the discussion of freight rate matters "railway supply men are not to be regarded as business men" or identified with *shippers*. Why not? Companies furnishing equipment, materials and supplies to the railways pay more than $250,000,000 a year in freight bills, or 15 per cent. of the total freight revenue of all the railways. As managers of one of the largest groups of industries in the country we have a right to be heard like any other business men. If there is an advance we must pay our share. We are no more eager than others to assume new burdens, but while we are deeply interested in seeing that the carriers have adequate revenues we know that the public welfare is equally involved.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Spokane International has ordered one locomotive from the American Locomotive Company.

The Shannon Copper Co., Clifton, Ariz., has ordered one locomotive from the Baldwin Locomotive Works.

The Colorado & Southern has ordered 10 Pacific and five Mikado locomotives from the Baldwin Locomotive Works.

The Czarnikow-Rionda Co. has ordered one mogul freight locomotive from the American Locomotive Co. It will have 19-in. x 24-in. cylinders, 54-in. driving wheels and a total weight of 113,000 lbs.

The Atchison, Topeka & Santa Fe is having built at the Baldwin Locomotive Works plant two locomotive tanks having a capacity of 12,000 gals. of oil. The tanks are equipped with equalized trucks.

B. T. Babbitt has ordered a four-wheel saddle tank switching locomotive from the American Locomotive Co. It will have 11-in. x 16-in. cylinders, 33-in. driving wheels and a total weight of 38,000 lbs.

The Belmina Consolidated Asbestos Co. has ordered a four-wheel saddle tank locomotive from the American Locomotive Co. It will have 9-in. x 14-in. cylinders, 29-in. driving wheels and a total weight of 24,000 lbs.

The Northwestern Pacific has ordered from the American Locomotive Co. four 10-wheel passenger locomotives with 20-in. x 26-in. cylinders, 63-in. driving wheels and a total weight of 168,000 lbs.; also two six-wheel switchers with 19-in. x 24-in. cylinders, 51-in. driving wheels and a total weight of 120,000 lbs.

CAR BUILDING.

The United Fruit Co., New York, is in the market for 100 cars.

The Canadian Pacific has ordered 211 fifty-ton Otis coal cars from the Hart-Otis Car Co.

The Toronto, Hamilton & Buffalo has ordered six Hart convertible cars from the Hart-Otis Car Co.

The Halifax & Southwestern has ordered 20 thirty-ton Hart hopper ore cars from the Hart-Otis Car Co.

The Philadelphia Rapid Transit is to buy 20 electric cars for elevated service. This item is unconfirmed.

The Cudahy Oil Tank Line, reported in the *Railway Age Gazette* of May 6 as in the market for cars, has ordered 10 all-steel tank cars of 125 and 250 bbls. capacity.

MACHINERY AND TOOLS.

The Chicago & North Western is taking prices on 59 machine tools in addition to those mentioned in the *Railway Age Gazette* of March 11.

The Detroit United Railway has installed 10-ton hand-power Northern cranes, 30-ft. to 34-ft. span, in two of their substations. These were furnished and installed by the Northern Engineering Works, Detroit.

IRON AND STEEL.

The Boston Elevated is in the market for 500 tons of rails.

The New York, Chicago & St. Louis is in the market for 2,000 tons of bridge steel.

The Northern Pacific has ordered 7,000 tons of bridge steel from the American Bridge Co.

The Chicago Great Western has ordered 1,500 tons of bridge steel from the American Bridge Co.

The Milwaukee Electric has ordered 3,300 tons of structural steel from the Worden-Allen Co.

The Pennsylvania Lines West have ordered 3,600 tons of bridge steel from the American Bridge Co.

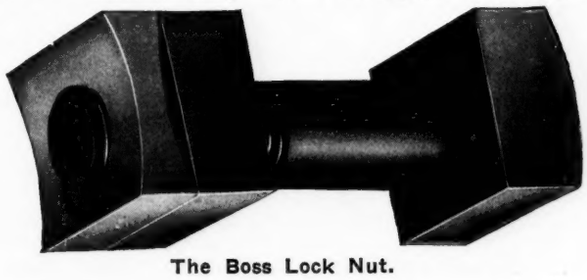
The Seaboard Air Line has ordered 16,600 tons of O. H. rails from the Tennessee Coal, Iron & Railroad Co.

The Tucumcari, Portales & Gulf is in the market for 60 or 65-lb. rails, new or relay, for July or August delivery at Texico, N. Mex.

General Conditions in Steel.—It is expected that the temporary understanding that has been arrived at between the government and the railways, in relation to the proposed increase of freight rates, will encourage the railways to go ahead with improvements and extensions. Some small orders have been placed during the past few days and the indications are that they will be followed by large ones.

The "Boss" Nut Lock.

The accompanying illustration shows what is known as the "Boss Nut," a device of remarkable simplicity. It accommodates itself to bolts of rated size, which may be undersize, by bending or yielding backward until its threads meet the bolt threads, each set of threads registering more deeply into the thread-valley. A nut holding device of this character should be indestructible, and in its application strengthens



The Boss Lock Nut.

the hold of the common nut used with it, by increasing the number of threads involved in the function, as well as performing the work of a high-class nut lock by leaving its rigid position when necessary in being wrenched home, and curving back to more perfectly and tightly fit the bolt, where it will remain until wrenched off. It can be removed with the same wrench as the common nut, either with it, or singly, and may be re-applied any number of times. It is manufactured by The B. M. Osbun Company, Chicago.

Steel Barges.

Considerable interest has been manifested lately in the improvements contemplated by the United States government to make the inland rivers, particularly the Ohio and Mississippi, navigable during a longer period each year. In order to make these rivers of general benefit to shippers, the first essential is continuous service, and with such service will come the craft in which available cargoes can be transported. During the past few years a great many boats and barges of steel construction have been designed and built at the Ambridge plant of the American Bridge Company, New York.

Barges have been built for transporting coal, oil, sand and other bulk commodities, but to no marked degree have steel barges been used to transport steel products. It is therefore of considerable interest to note that an order has just been placed with the American Bridge Company for 10 steel barges to carry the products of the subsidiary companies of the United States Steel Corporation for the Pittsburg district mills to Cincinnati, Louisville, St. Louis, Memphis, Vicksburg, New Orleans and other ports on the Ohio and Mississippi rivers. Arrangements have been made with the Monongahela River Consolidated Coal & Coke Company to tow the barges. These are not the first steel barges to be used in carrying steel, as the fleet of steel coal barges built by the American Bridge Company for the American Steel & Wire Company, 30 of which are now in commission, have, for several years, been carrying coal to the mills and billets from the Shoenberger works to Rankin and Braddock on the return trip to the coal mines. For some time past steel rails, wire, nails, cotton, ties, pipe, etc., have been carried to southern ports by the Monongahela Consolidated Coal & Coke Company for the constituent com-

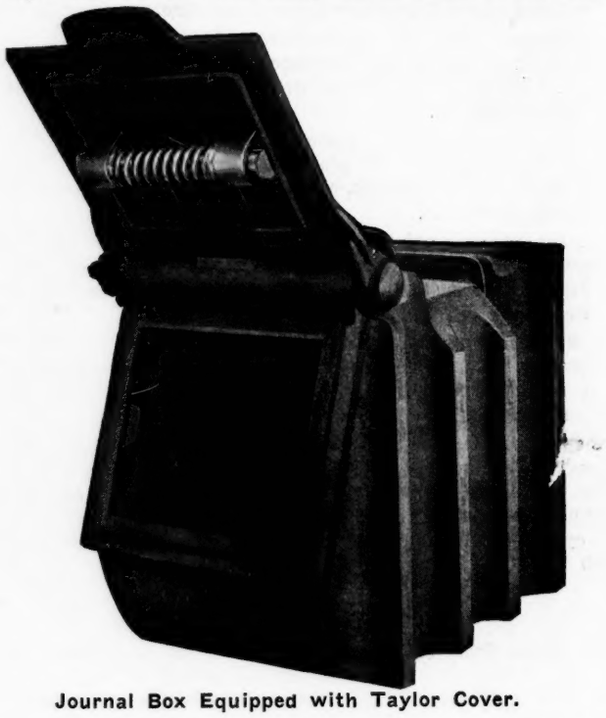
panies of the Steel Corporation in wooden model barges and some are still in service. The tonnage handled in this way has been from 40,000 to 65,000 gross tons annually. The maximum tonnage of steel rails alone is said to have been as much as 150,000 gross tons in one year, and the average number of round trips for a barge at present is two per year. With improved river conditions and continuous available water, this might be increased so that each barge would make at least five round trips to New Orleans annually, call at a correspondingly larger number of intermediate ports, and with such service, at least 250,000 gross tons of steel products could be distributed annually from the Pittsburgh district to Ohio and Mississippi ports.

The accompanying drawing shows the type of barge now being built. It is 200 ft. long over all, 36 ft. beam, and 10 ft. 6 in. deep, the deck being crowned 8 in. at the center. The sheer at bow and stern is 18 in. After due consideration, the scow type was adopted, the rakes fore and aft being the same. The barge is of steel construction throughout with the exception of a 4-in. wood floor in the hold. Plates, angles, beams and channels, such as are ordinarily rolled are used throughout, no special section being employed. Five transverse watertight bulkheads and a longitudinal truss divide the hold into eight compartments. Openings are located in the deck centrally over each compartment, and are made large enough to receive rails 33 feet in length below deck.

A cargo box covers the greater portion of the deck, and this also is built of steel plates and shapes with the exception of the sides, which are of galvanized corrugated steel. Three sliding doors on each side of the barge, and one at each end permit loading and unloading nails and other wire products, ample space having been made for loading materials through the roof of the cargo box, hatches being provided immediately over the deck opening so that rails, pipe and structural material can be lowered into the hold by a crane through both openings. Provision has also been made for loading 60-ft. rail and 70-ft. structural material through the two central roof hatches, this material, however, to be carried on the deck and not in the hold. The roof hatches have steel plate covers, amply stiffened with angles and designed to be weather proof. As it is customary to carry mixed cargoes, it was necessary to design barges of a sufficient cubical capacity to carry the bulky and comparatively light material, such as field fencing and barbed wire, and when such cargoes are carried, a cargo box will be required. For rails, pipe and structural material, if not over 33 ft. long, the hold only will be needed to carry the material, but for the long lengths of structural material and rails the deck will be used, although other materials can also be carried in the hold. The draft of the barge loaded to its capacity is 9 ft., provision having been made for 18-in. free board. The barge light will draw 26 in.

Taylor Improved Journal Box Cover.

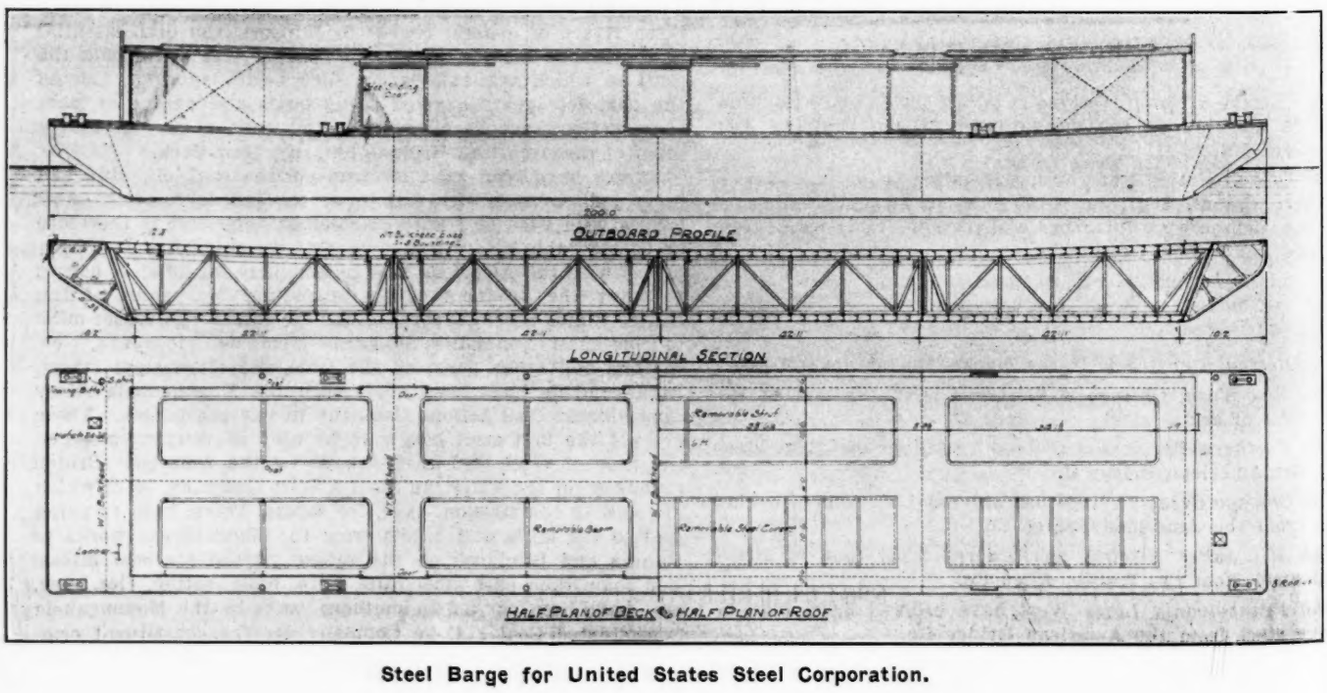
The accompanying illustration shows a box having an improved journal box cover made by the W. P. Taylor Company, Buffalo, N. Y. The illustration shows the self-locking device, consisting of dogs, a spiral spring on the cover and raised projections on the inside of the box. This device, used with the M. C. B. flat spring, closes the cover automatically and holds it tight. The hinge lug, being the full width of the box, is intended to prevent water and dust from entering at the top. The box has two faces, one of which is set back



Journal Box Equipped with Taylor Cover.

¼ in., and the cover is shaped to correspond, to make the front of the Taylor box dust proof.

The malleable iron cover is pressed to a tight joint around the lower face and along the back of the hinge by hydraulic pressure. The hinge pin is secured by a nut and then riveted to prevent the cover from being removed or stolen. This company is prepared to furnish this style of lid and face for any design of box. The grade of iron used for these boxes is said to be made from a special mixture which gives the greatest strength and best wearing quality.



Steel Barge for United States Steel Corporation.